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ARCHIVES

OF

OTOLOGY

EDITED IN ENGLISH AND GERMAN

BY

DR. H. KNAPP
OF NEW YORK

DR. O. KÖRNER
OF ROSTOCK

DR. A. HARTMANN AND DR. U. PRITCHARD
OF BERLIN OF LONDON

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ARCHIVES OF OTOLOGY.

DOES EARLY TREATMENT OF ACUTE INFLAMMATION OF THE MIDDLE EAR PREVENT THE MORE SERIOUS COMPLICATIONS?[1]

By E. L. MEIERHOF, M.D., New York.

TO some, perhaps, the title of these few remarks may seem superfluous. It is true that text-books on otology and many separate articles on acute inflammation of the middle ear have laid down the dictum that prompt and efficient treatment would be the means of abridging what otherwise would be a serious process.

The question that is submitted to-night for consideration is —Does the later and larger experience of single or the collective experience of many observers justify or emphasize at present our attitude on this question, or have there been reasons for modifying their views?

One of the most difficult problems in the study and practice of medicine is to decide between what is a coincidence or a true case of cause and effect; and as our knowledge becomes more exact this problem becomes easier of solution. So it is with the question under consideration.

In dealing with inflammation of the middle ear, one must consider the complicated anatomy with its possible anomaalies, which include, besides the tympanum and the Eustachian tube, the aditus ad antrum and antrum with its communicating cells, besides the many adjacent structures that have no relation to audition, which may also become involved in the inflammatory process; the individual and his general or local condition, and the character of the infection;—these and other circumstances make up the controlling influences at work as causative factors in the production of the severity and extent of the inflammation and its evolution.

---

[1] Read before the Section on Otology of the New York Academy of Medicine, February 11, 1902.

It may be observed in one case that the drumhead is very much reddened, and in spite of severe pain and some rise of temperature there is no tenderness over the mastoid; and in another case the objective picture is not so striking but the mastoid is tender. In the first case, the mastoid may become tender later, and in the second, the tenderness may subside either with or without treatment. I believe, however, that in every case of acute inflammation of the middle ear the mastoid antrum is more or less involved, even though we may not obtain marked evidence of the fact; that the early treatment ameliorates the symptoms cannot be gainsaid, as the experiment has been successfully tried too often by many careful and reliable observers, and as is shown by the prompt relief from pain and fall of temperature. Especially is this the case in children.

What are the serious complications? Are we to limit them only to empyema or caries of the mastoid, sinus involvement, brain abscess, and meningitis? Yes, so far as immediate danger to life is concerned; but I would also consider chronic suppuration, with all its disturbances to hearing and the sensorium, as a serious complication. The individual with a suppurating ear is known to be in constant danger, so that we must not be content in warding off the conditions that may immediately menace life, but we should restore the organ to its former integrity in as short a time as possible; for the longer we wait the greater will be the destruction, and the less are the chances for improvement. Therefore, do we by our present means of treatment succeed in cutting short the ravages of acute middle-ear disease when it is seen early?

Would the great majority of cases of mastoid disease operated upon have been prevented by timely minor treatment? Furthermore, what proportion of the cases seen early enough to receive preventive treatment are followed by serious complications?

It is unnecessary for me to state what is the treatment of acute middle-ear inflammation, as this subject has been fairly well threshed out. If we do succeed in our purpose, why is it that as specialists we have, in spite of our efforts, so many cases of ear diseases which require larger operative measures? Is it due to the ignorance or indifference of the laity on the one hand, and a considerable proportion of the medical profession on the other? It is true that a large proportion of the cases of acute middle-ear disease get well in spite of neglect, indifference, or maltreatment. The late Dr. Edward Pyle has stated before this Section, that there are many busy practitioners who rarely see serious complications in connection with diseases of the ear. If such is the case in some communities, it is certainly not in all of them, as is proven by the number of practitioners who journey from various parts of the country to the larger medical centres, to obtain instruction in the technique of the mastoid operation; however, in our own community the mastoid operation has certainly increased in frequency, as is shown by the large number of practitioners who are to-day operating, besides the increasing number of mastoid operations that are performed by the more prominent otologists.

From my own experience, four cases will be cited in answer to the title of this paper, which will serve as types of different classes of acute disease; the patients were seen before the drum had ruptured, where it was necessary to open the mastoid subsequently. The first is represented by an infant of seven months, who had been having fever for over one week from no known cause, until examination of the ears revealed inflammation in the right drum. The drumhead was not incised on account of the opposition of a colleague, and in a few days the temperature subsided; but a little later a discharge of pus was observed to flow from the ear, which continued for about ten days, when swelling was observed over the mastoid. An operation was promptly performed, revealing an empyema of the antrum. It is believed that had the tympanum been opened at the first observation, the mastoid operation would likely have been unnecessary.

The second type of cases was that of a lady, fifty years of age, who, before consulting me, had severe pain in the left ear for a number of days, with no discharge and little temperature. The drumhead was apparently not very much inflamed or protuberant, but there was tenderness on moderately firm pressure over the region of the mastoid antrum. In spite of incising the drum at three different times, which was followed in either case by little discharge, and the application of ice, and later heat, the pain in the mastoid increased, accompanied by headaches, especially at night, so that after two weeks it was decided to expose the mastoid, with the result of finding the cells filled with pus and granulation tissue.

The third type of cases was that of a child of about fifteen months, where there was no history either from the family or the doctor in attendance to indicate any previous evidence of disease, until it was noticed that there was a swelling behind the right ear without any discharge from the canal. An examination of the canal showed it to be dry, but the drum was very prominent, thickened, and discolored, and incision of the drum gave vent to a thick creamy pus. The next day the mastoid was opened, and was found to be extensively diseased. Perhaps this case may have been originally a chronic one of a mild type wherein the outlet for the secretion had healed, thus finally the disease developed in another direction. However, as this is only a surmise, it was considered an acute attack of a rather virulent nature.

The fourth type of cases is represented in a boy of fifteen after scarlet fever, where in spite of free incision of the right drumhead pus rapidly formed and increased in quantity, accompanied by increasing symptoms, necessitating the opening of the mastoid and revealing the usual conditions.

The first case represented the type where, it is thought, had the drum been opened at once, the mastoid operation would have been avoided. This represents a very common type of inflammation.

The second case is a type where the disease was more in the mastoid than in the tympanum, as pus was never observed to flow from the openings in the drumhead, but instead there was a slight serous discharge. The incisions were made under anæsthesia. Here was a case where early treatment was of no avail.

The third case developed so rapidly and with such virulence that no half-way measures were to be considered.

The fourth case represents the more common type, such as we see in the exanthemata and influenza affecting badly conditioned individuals, where in spite of free opening of the drum the process goes on, granulations form in the aditus, blocking drainage from the mastoid and thus producing retention symptoms sufficient to demand the opening of the mastoid.

These four types, it is sure, can be duplicated by other observers, but they have been sufficient for me to modify the views I formerly held regarding the results of treatment of acute inflammation of the middle ear. Experience has taught me that, in nearly every case, early treatment, of which the most important is free incision of the drumhead (all other treatment is secondary), relieves pain both spontaneous and induced, and in children should be followed by a fall of temperature, even if the exudate is only serous. We should, if possible, anticipate rupture by incision, and thus prevent perforations in the drum in positions where drainage will be interfered with; and, furthermore, the artificial opening heals better and with less scarring. Further, chronic suppuration is undoubtedly prevented by the timely incision; however, in spite of our efforts there will be a few cases that, owing to anatomical peculiarities and other conditions, which will not get well but grow worse, and nothing short of a thorough exposure of the mastoid will suffice to restore the patient to health. What percentage of cases is not controlled by early treatment is not possible for me to state, but I believe it is small.

A word about needless opening of drums. Has any one seen harm, where there were pain and redness of the drumhead, from making an incision aseptically? It is a safe rule to incise where there is doubt, especially so in the exanthemata; perhaps some would recover without the incision, but one will never regret making an early opening. However, where a good view is obtainable, and the patient can be under constant observation, it would not be necessary to incise a drumhead that had merely a few streaks of redness. It is important that we should recognize the fact that there are some cases where an opening of the drum is not sufficient, but that an early opening of the mastoid will belong to the prophylaxis of destructive ear disease; it is true occasionally that in some of the early operations on the mastoid we find only a limited amount of disease, and feel afterwards we might have postponed the major procedure; however, we are sure our patient is safer than he was before the operation. The mastoid operation for acute conditions is now attended with so little danger that perhaps this might account for the readiness with which the operation is performed, and may be one of the reasons that mastoid operations are on the increase. Formerly before a mastoid was opened, œdema was usually present; then came a period where gentle pressure on the mastoid inducing pain was the indication; later, pain on deep and firm pressure became an indication.

Thus we see the indication for operating will be found in a much larger number of cases, until, as stated before, it is predicted the mastoid will be opened for profuse suppuration of the middle ear of a few weeks' duration, even though there is no pain, and thus do away with the more chronic processes and the need for radical operations. However, my experience has been that for the prevention of chronic suppuration without mastoid symptoms the minor treatment, with few exceptions, has yielded all that could be desired, and from my observation and knowledge of cases operated upon by others, a very few have required the major operation where the cases have had the benefit of early expert treatment.

REPORTS OF SOCIETIES.

I.—REPORT OF THE SEVENTY-THIRD MEETING OF THE GERMAN NATURALISTS AND PHYSICIANS, IN HAMBURG, SEPTEMBER 28, 1901. SECTION ON DISEASES OF THE THROAT, NOSE, AND EAR.

BY DRS. SENFF AND THALER.

PRESIDING OFFICERS, DRS. THOST AND LUDEWIG.

Dr. LUCAE (Berlin). **Contributions to the knowledge of the function of the membrane of the round window. Successful operation on the round window.**

A patient, forty-one years old, suffered from progressive deafness and severe tinnitus. After two weeks' unsuccessful treatment, on the urgent request of the patient, the drum, with the hammer and incus, was excised. At the entrance of the round window, two somewhat spherical exostoses were found, completely occluding the window. The operation was without relief. The niche of the round window was enlarged with a small burr, but the membrane was left intact. At first there was great sensitiveness to loud noises, then, beginning on the twelfth day, the hearing gradually improved. At discharge, four and a half months later, the patient could hear whisper in 3.5 m, while before the operation she was only able to hear at a distance of .8 m. The subjective noises had disappeared, the drum had regenerated down to a very small opening. The result was the same after eight months. Later, complete closure of the drum membrane was followed by diminution of hearing, which was again improved by excision.

Dr. SCHWARTZE (Halle). **The diagnostic importance of lumbar puncture in otology.**

After a brief review of the history of Quincke's lumbar puncture, the speaker said that this method had been employed in the Halle Clinic since 1895 as an aid to diagnosis, and he had come to the following conclusions:

1. The positively proven negative result of the puncture and the evacuation of a normal, clear liquid, excludes diffuse purulent meningitis in cases of otitis with intracranial complications. 2. The positive result (clouding by increased number of leucocytes and the presence of micro-organisms) shows, under the same conditions, the presence of a diffuse purulent meningitis or cerebro-spinal meningitis; the latter, if the meningococcus intracellularis is found in the liquid. 3. The opalescent turbidity of the cerebro-spinal fluid points, with considerable probability, to the presence of a tuberculous meningitis complicating the otitis, even though no tubercle bacilli are found. 4. Our experience has been that the sinus thrombosis has been associated with decided increase in cerebro-spinal fluid. 5. Lumbar puncture, if performed correctly and without aspiration, is without danger. Finally the speaker recommended lumbar puncture highly as an aid to diagnosis.

Discussion.—Dr. WINCKLER (Bremen) does not think that the results of lumbar puncture can decide whether the mastoid should be opened or not. In urgent cases, if the general conditions permit it, he thinks that the operation should be done at once without waiting for the result of puncture.

Dr. FRIEDRICH (Kiel). **Further observations on the diagnostic value of the acoustic nerve reaction.**

Dr. HARTMANN (Berlin). **The deaf in the schools.**

The Doctor comes to the following conclusions: 1. As a considerable number of children with curable deafness are found in the schools and are not treated, it is a sufficient cause to recommend medical examinations in the schools. The physicians should discover the cause of deafness and endeavor as far as possible to remedy it. 2. In cities where there are otologists it is desirable that they should coöperate with the school physicians. 3. Children with a high grade of deafness uninfluenced by treatment should receive special attention, just as in cases of deaf-mutes, since the mental development remains in a very low state. 4. Very deaf children must be treated by learning lip-reading and by extra studies so that they may profit by class instruction. If these precautions cannot be observed the children should be handed over to a deaf-mute institution.

Dr. Peters (Rostock). **Vertigo in eye diseases.**

The speaker reviews various causes that produce ocular vertigo, and shows that not only changes in the ocular muscles, but other optical disturbances, with the coöperation of the mind, may produce vertigo. The nystagmus of miners is the result of an altered position of the body and consequent irritation of the vestibulo-canalicular apparatus on the return to the former normal body position.

Discussion.—Dr. Lucae. In 264 cases of defect in the labyrinth (specially the horizontal canal), 179 had vertigo, 83 had nystagmus. Of 37 cases with vertigo, 8 had no defect in the labyrinth. On the other hand, nystagmus was always associated with labyrinthine defect. In over a dozen cases of injury to the labyrinth produced by operation, vertigo was present with but one exception, presumably due to sudden evacuation of the perilymph. Vertigo may set in not only in positive but also in negative pressure in the middle ear. This symptom is almost never observed in children, up to the eighth year.

Dr. Schwartze. Vertigo in caries of the labyrinth depends on irritation of the vestibular nerve and consequently cannot occur after the destruction of the terminal apparatus of this nerve. Mechanical irritation (probing) or thermic (action of concentrated sunlight on the labyrinth wall with superficial caries) produces vertigo and nystagmus with the certainty of a physical experiment.

Dr. Thost spoke of vertigo occurring in swelling of the Eustachian tubes and laryngeal vertigo.

Dr. Engelman has a patient where both maxillary antri have been opened. On tamponing the left (not the right), vertigo can always be produced.

Dr. Kuemmel (Breslau) thinks that a distinction should be made between subjective vertigo and objective disturbances of the equilibrium. He had also found labyrinthine defects in all cases of nystagmus.

Dr. Lucae has observed optical vertigo in a case where increased pressure within the tympanum had caused strabismus from irritation of the sixth nerve.

Dr. Suchannek (Zurich). **Forman, a new remedy for coryza.**

This is chlor-methyl-menthyl-ether, a non-irritant and very agreeable remedy for coryza. It is applied in the form of forman cotton of which small pledgets are introduced into the nose, or in the form of forman tablets which are dissolved in hot water and used by insufflation. The action is due to nascent menthol and formalin. The application should be made in the beginning of a cold and may be used during influenza and hay-fever epidemics. A coryza of two days could not be aborted but was decidedly shortened and the symptoms relieved. The remedy is proposed for its favorable action on a number of other affections of the upper air-passages.

Dr. WINCKLER (Bremen). **Modifications of the line of incision in exposure and after treatment of diseased middle-ear cavities;** with presentation of patients.

Three cases are presented where the mastoid had to be opened on account of acute otitis media. The posterior bony canal-wall was removed. In broad ear-canals the latter was preserved. If the canal was narrow and sufficient drainage through the tympanum was not assured or if the cavity in the mastoid process was very large, it was thought well to enlarge the membranous canal by a plastic operation and to drain the antrum into the dilated auditory canal. In performing the radical operation, Winckler is guided by the breadth of the mastoid process, the size of the bony canal, and by the possible involvement of the Eustachian tube in the diseased process. If the canal is wide, the posterior and upper parts of the membranous canal are elevated and the incision approaches the auricle according to the size of the mastoid process. If the periosteum in the mastoid region is healthy, it is made use of as a flap, which is transplanted into the bony cavity according to Stacke's suggestion. If the Eustachian tube is involved, the membranous canal is completely detached. If then a sufficient space to treat the tubal ostium is not given, the anterior canal-wall is removed as much as is necessary. The movements of the maxillary joint can then be distinctly seen. In two of the three cases, skin grafts were later applied. In cholesteatoma, Winckler makes use of the retro-auricular opening. He closes this opening only when the cholesteatomatous lamellæ have not destroyed the tympanic membrane and relapse can probably be excluded. Passow's plastic operation is then employed. When the cholesteatoma has completely destroyed the membrane and is adjacent to the bone, Winckler makes a retro-auricular opening which he completely surrounds with the neighboring skin. It is necessary in this plastic operation to take care that the auricle is closely applied to the head, so that the opening is not noticeable. In one patient, the cholesteatomatous membrane had completely eroded the lateral wall as well as the roof of the tympanum and the antrum and could not be removed from the dura of the temporal lobe or of the sinus. Under the influence of the retro-auricular opening and free access of air, the membranes resumed the appearance of healthy epidermis.

A case of sinus thrombosis was then demonstrated which had been healed by trephining and ligature of the internal jugular, and another case of sinus thrombosis was presented without ligature of the vein. The speaker dilated upon the advantages of the skin-periosteal flap which can be applied in various ways. This flap can only be applied when all of the soft parts of the skull are completely intact.

Discussion.—Dr. LEUTERT confirms the opinion that the removal of the anterior canal-wall is without danger. The lateral wall of the bony Eustachian tube can be removed and the carotid exposed without danger. Whether, however, this is necessary to relieve suppuration at the tympanic orifice of the tube is uncertain. The speaker is inclined to think that one can accomplish as much with the use of a catheter and bougie. The speaker mentioned two cases from his practice (a piece of the bougie remaining in the bony part of the Eustachian tube; epidural abscess at the apex of the pyramid from extension of the suppuration to the carotid canal), where the removal of the anterior canal-wall, in addition to the external and internal walls of the Eustachian tube, could have been rationally attempted.

Dr. NOLTENIUS thinks that the persistent retro-auricular opening should not be used. A properly executed plastic operation according to Koerner is always sufficient.

Dr. SCHWARTZE has frequently observed perichondritis following this latter plastic procedure.

Dr. NOLTENIUS thinks that this accident only occurs under insufficient asepsis and can always be avoided.

Dr. WINCKLER. **Further contributions to the knowledge of accessory-sinus disease.**

Three cases are presented where the operation was done for empyema of the maxillary and ethmoidal sinuses. In the first case the suppuration had led to necrosis of all the walls of the maxillary sinus except the lower, necessitating resection of the superior maxilla. The defect is visible through which he exposed the sphenoidal cavity, and the entrance to the frontal sinus can be directly observed. In two other cases the ethmoid was cleaned out after removing the facial wall of the maxillary antrum through the canine fossa. In one case of which part of the floor of the ethmoid was situated over the antrum, with the aid of an obturator a view could be had of the ethmoidal and sphenoidal sinuses. Intranasally the middle turbinal appeared intact. In the third case, part of the lateral nasal wall had to be removed over the canine fossa to eradicate the ethmoidal cells. The middle turbinal had to be removed, and the corresponding nasal cavity was unusually wide, furnishing ready access to the diseased sphenoidal sinus. The opening in the lateral wall of the nose subsequently closed down to a small hole. Immediate suture of the wound through the facial wall of the maxillary antrum had been practised a number of times with good results, but this procedure is only applicable to certain cases.

Five cases are shown as examples of the cosmetic results following osteoplastic resections of the nasal bones for the relief of empyemas of the frontal and ethmoidal sinuses.

The incision through the skin and bone depends upon the prominence of the corrugator folds, the shape of the external nasal skeleton, and the X-ray picture.

The complete obliteration of both frontal and ethmoidal sinuses, after removal of the anterior frontal surface and the upper and inner orbital walls as well as part of the upper nose, had to be performed in a case of necrosis of the anterior wall of the frontal sinus. The enormous disfigurement in this case is shown as an example against this and similar methods of Kuhnt and Roepke. The cosmetic result following osteoplastic operation for eradication of both frontal and ethmoidal sinuses is also shown, though the scars in these cases were also disfiguring, nevertheless the general shape of the face was not interfered with.

In a further case the scars resulting from osteoplastic exposure of both frontal sinuses, according to the Czerny-Gussenbauer method, were shown. The indications for the various osteoplastic operations were then discussed. The choice of method depends upon whether the disease is unilateral or bilateral. In unilateral cases the operative procedure depends upon the kind of disease, the extent and condition of the external walls, the size of the cavities, and the shape of the nasal skeleton.

Dr. SCHEIBE (Munich). **Demonstration of a soft papilloma of the nose.**

This rare tumor was removed by Prof. Bezold from a patient who had suffered for years from frequent and severe epistaxis and headache. The left nostril contained a dirty-colored, soft, movable tumor, which was snared off in two sittings. Eighteen months later the tumor recurred and was again removed. Histologically the growth proved to be a soft papilloma with a cellular stroma with a uniform covering of cylindrical epithelium. Whether the growth was benign or not cannot be ascertained, as the result of the case is not known. The general weakness of the patient and the rapid recurrence tend to a poor prognosis.

Dr. Scheier (Berlin). **Several anomalies of the nasal accessory cavities.** Demonstration of specimens.

A sphenoidal cavity was shown which was divided by a horizontal septum. Another had two sagittal septa, an almost frontal and transverse septum of the sphenoidal cavity, a maxillary recess of the sphenoidal cavity, and, finally, specimens with three frontal sinuses and two specimens with unusual deviations outward of the external nasal wall into the antrum.

Dr. Partsch (Breslau). **The dental origin of empyema of the antrum of Highmore.**

The extension of a diseased process of the teeth to the maxillary antrum depends on the anatomical relation which certain teeth bear to the antrum. These anatomical relations occur between the second premolar and the second molar, rarely between the first premolar and the wisdom teeth. Hence, a dental origin can only be assumed in the presence of disease of these teeth. Simple caries without exposure of the pulp or disintegration of the tooth medulla *never* causes empyema. A frequent cause of associated disease in the antral mucous membrane is found in chronic disease of the dental periosteum. Diseases occurring in the teeth which are particularly apt to set up purulent empyema in the antrum are manifold, but caries of the teeth alone exerts no influence on the antral mucous membrane.

Dr. Demme (Berlin). **On anomalies of the blood-vessels in the pharyngeal region.**

The author has examined about 300 pharynges and has collected clinical observations. The occurrence of pharyngeal hemorrhage after operation depends on the superficial position of the vessels. Clinically their position can be observed by visible pulsations. It is possible to distinguish between the pulsations and the abnormally distinctly visible blood-vessels of aneurysmal, bulbous, or cavernous vessels and pulsating angiomas. The positions in the pharynx where these changes are apt to occur are as follows : (1) Posterior pharynx, which includes the posterior and lateral pharyngeal walls ; and (2) the tonsillar region.

In the posterior pharynx the internal carotid artery alone is of importance. Various forms of loops are described in this region. They are of no clinical importance, and, as they are visible, can easily be avoided. The deaths after adenoid operation from fatal hemorrhage were probably the result of injury to these variations in the carotid. Aneurysmal changes of the carotid at the posterior pharyngeal wall and angiomas connected with the carotid occur very rarely in this region.

As regards the tonsillar region the author considers it incredible that such small arteries as the tonsillar and palatal can produce the terrible and fatal hemorrhages which have been observed after injuries to the tonsils. Numerous examples have convinced the author that the arch described by the lingual artery over the stylo-glossus causes the pulsation of the tonsil. These pulsations are still larger if the lingual and maxillary arteries have a common origin.

Regarding post-operative hemorrhage, it is especially important that if the lingual artery describes a particularly pronounced arch, the tonsillar and palatal arteries are apt to originate from the crest of this arch, and they then have a large lumen. Dilatation of the vessels appears in this region only in connection with angioid tumors. These tumors are of great malignancy and. not very rare.

Dr. von Schroetter, Jr. (Vienna). **A peculiar condition of the nose.**

A patient, fourteen years old, with phthisis, presented herself, showing swelling of the left nasal mucous membrane, much secretion, absence of the anterior extremity of the middle turbinal, and rough bone in the neighborhood of the sphenoid. A probe could be passed without meeting any resistance or causing the patient any pain for a distance of 13 *cm* into the nose. X-ray pictures showed that the probe had entered the cranial cavity. At the autopsy, the base of the brain was extensively destroyed by a tubercular tumor mass, into which the probe had entered.

Dr. Schwartze (Halle). **Changes in the fundus oculi in intracranial complications of purulent otitis media.**

In 1892, Barnik had reported 23 of these cases. Since then

97 other cases have been observed. From these the following conclusions may be drawn: In 52 cases, the eye grounds were normal; in the remaining 45, optic neuritis was present in 23, choked disc in 23, vascular changes at the optic nerve in 19. In all kinds of otitic intracranial complications, the changes of the eye grounds occur with varying frequency: 18 % in extradural abscess, 42 % in brain abscess, 44.8 % in sinus thrombosis, 50 % in purulent meningitis, and 87.5 % in hyperæmia of the meninges and cerebral tumor. About one half of the cases, as Barnik has already shown, were followed by changes in the eye grounds. In regard to the so-called uncomplicated cases of otitic brain disease, the following figures serve to judge of the cause of the changes in the eye grounds: 11 cases of extradural abscess, 9 normal, 2 combined (18 %); purulent non-complicated. leptomeningitis 14 cases, 6 normal, 8 diseased (57 %); non-complicated sinus thrombosis, 5 normal, 3 diseased (37.5 %); 19 cases of brain abscess, 11 normal, 8 diseased (42.1 %).

Dr. GUYE (Amsterdam). **Four cases of curetting the sphenoidal cavities in relapsing nasal polypi.**

In the first case the author had removed nasal polypi in 1895 and 1897, which, among other symptoms, had produced headache. The patient was relieved, but in 1900 a further relapse occurred, only partially improved by the removal of small polypi. The patient was unable to attend to his work and was quite a neurasthenic. The sphenoidal cavity was opened and scraped out with a sharp spoon according to Zuckerkandl's method, and the patient's health was completely restored.

In the second case nasal polypi developed in 1889, following empyema of the maxillary antrum. After operation and cure of the empyema, the patient recovered. In 1892, 1893, and 1897, relapses occurred, which also were cured. In March, 1901, the patient suffered a great deal of headache. Small polypi were removed from the anterior wall of the sphenoidal sinus, the cavity was exposed and curetted with excellent results.

The third case was one of nasal polypi complicated with otitis media and aural polypi. The patient was cured after the sphenoidal cavity was curetted.

The fourth case was that of a young woman who had suffered from nasal polypi, which recurred after their first removal, but were permanently cured after curetting the sphenoidal sinus. The author did not find it necessary in these four cases to remove the middle turbinate, and believes that the polypi communicated with the sphenoidal sinus, which was in many cases responsible for relapses of nasal polypi. He observed no ocular symptoms in the four cases.

Discussion.—Dr. WINCKLER recommends great caution in intranasal operations on the sphenoidal sinus. Dr. FLATAU is also of this opinion, and recommends control of the position of the probe by the X-ray. Dr. CORDES recommends his double knife for the removal of the anterior wall of the sphenoidal sinus. Dr. NOLTENIUS does not think that this working in the dark under proper care is so very dangerous.

Dr. REINHARD. **A case of chronic purulent otitis complicated by fracture of the base of the skull; recovery.**

A girl, five years of age, who had been suffering for three years with chronic otorrhœa, fell out of a window and was unconscious for ten days with aphasia, paralysis of the right extremity, and immobility of the pupils. On examination, the canal was collapsed. No details in the depth could be seen. Behind the ear was a fluctuating tumor, pressure on which caused pus to flow out of the ear. In other words, there was perforation of the posterior bony wall of the canal. At operation a piece of bone 3 *cm* × 2 *cm* was removed. Recovery. It is remarkable that here, notwithstanding the complicating fracture of the base, no meningitis resulted, and that the patient recovered after operation was undertaken.

Dr. CORDES. **Treatment of dry middle-ear catarrh, especially sclerosis with air rarefaction in the external canal.**

Cordes has constructed an apparatus, a vacuometer in connection with an aspirator. The rarefaction should act for three to five minutes, and can in many cases be accompanied by catheterization. This procedure is to be recommended in all cases of not too advanced sclerosis, in tinnitus, and signs of pressure in the head without particular change in the drum membrane, and to remove symptoms of vertigo following increased labyrinthine pressure.

Drs. F. KLEMPERER (Berlin) and M. SCHEIER (Berlin). **The identity of the bacilli of rhinoscleroma and ozæna with Friedländer's bacilli.**

The ozæna and rhinoscleroma bacilli cause the same chemical products and cannot be distinguished between morphologically or biologically, and should be considered as one and the same species, resembling that of the bacterium Friedländer. The authors cannot regard this bacillus capable of producing two such dissimilar processes in the nose, especially as it is found frequently in the healthy nose.

Dr. F. SIEBERMANN (Bâle). **Contribution to the knowledge of genuine ozæna.**

Ozæna, in a clinical sense, is not sufficiently isolated. The microscopic characteristics are the metaplasia of the epithelium covering the turbinals. The usual seat for this change is the region of the middle turbinal. Metaplasia occurs as frequently in the narrow nose as in the broad one. In both varieties, accessory-sinus empyema is a complicating factor in one half the cases. In our statistics this complication occurred only in narrow-nosed individuals, a feature which we cannot explain, unless it is because metaplasia and empyema are usually found together in tuberculous subjects and a narrow facial skeleton is a part of the phthisical habitus.

II.—PROCEEDINGS OF THE OTOLOGICAL SOCIETY OF THE UNITED KINGDOM. ANNUAL GENERAL MEETING, MONDAY, DECEMBER 2, 1901.

Reported by Dr. W. MILLIGAN, Honorary Secretary.

Sir WILLIAM B. DALBY, President, in the Chair.

The following officers were elected: President, Mr. Urban Pritchard; Vice-Presidents—Drs. P. McBride, Edward Law, and Arthur Sandford; Honorary Treasurer, Mr. A. E. Cumberbatch; Honorary Librarian, Mr. E. Creswell Baber; Editor of *Transactions*, Mr. A. H. Cheatle; Honorary Secretaries, Drs. W. Milligan and W. Jobson Horne; Council—Sir W. B. Dalby, Drs. A. Bronner and Dundas Grant, Messrs. C. A. Ballance and Stephen Paget, and Prof. John Story.

Mr. RICHARD LAKE. A case of **removal of necrosed labyrinth.**

Mr. CHEATLE said the specimen was the best of its kind in London. He had seen all the specimens in London but had not seen such a complete one. He hoped Mr. Lake would have it properly mounted and present it to the Society with drawings for the *Transactions*.

Dr. COBBLEDICK. A case of **visible transmission of pulsation to a scar in the membrana tympani.**

Mr. LAKE said the scar evidently did not pulsate at the present time.

Dr. W. MILLIGAN. A patient upon whom the **complete mastoid operation** had been performed **with "grafting."**

The patient, a female aged thirty-two, had suffered for many years from right-sided suppurative middle-ear disease. The perforation was situated in the anterior portion of Shrapnell's membrane and was partially blocked by a tuft of granulation tissue. The discharge was very fetid. Attacks of pain were frequent. The hearing power was one fortieth of the normal.

Intratympanic irrigations were first of all employed. Later the membrane, malleus, incus, and outer attic-wall were removed. Suppuration still persisting and pain in the head being frequent, it was decided to perform a radical mastoid operation. This was accordingly done and was followed by the "grafting operation" of Ballance. An excellent recovery ensued, the hearing power improving to six fortieths of the normal.

Mr. DE SANTI and Dr. EDWARD LAW spoke favorably about the result of the operation and about the improved hearing capacity of the patient.

The PRESIDENT said that in many cases of successful grafting the hearing power was improved.

Mr. HILL asked whether the patient in such a case heard through the round window, or whether the free opening up of the cavity exercised a beneficial effect.

Mr. A. H. CHEATLE said that he had never known the hearing power made worse after the operation, but the great point was that the operation was done to preserve the patient's life.

Dr. MILLIGAN considered that the thorough curettage of the tympanic cavity and the liberating of the stapes from inflammatory adhesions were the main factors responsible for the improvement of hearing in such cases.

Mr. URBAN PRITCHARD thought that as the parts within the tympanum got healthier after the operation they also did get thinner and so allowed sound waves to reach the internal ear all the more easily.

Mr. CUMBERBATCH criticised the views as to the mechanism of hearing as usually taught. He considered that the object of the ossicular chain was to maintain the requisite tension between the fenestra ovalis on the one side and the fenestra rotunda upon the other.

Dr. DUNDAS GRANT and Mr. C. A. BALLANCE. A case of **temporo-sphenoidal abscess.**

P. B., male, aged eight. Admitted to St. Thomas's Hospital August 21st.

Previous history: Right otorrhœa since measles seven years ago.

Present condition: Commenced seven weeks ago with fever and headache. During the last five weeks he has vomited all food.

Condition on admission: A sickly-looking boy lying on his right side in bed with the limbs flexed. The skin is earthy-white and the body is emaciated. Questions are answered clearly and coherently, but the boy is sleepy and lethargic and complains of frontal headache. The right eyeball is paralyzed; the right pupil stable and dilated; the right disc shows optic neuritis. There is paresis of the lower part of the left side of the face, the left hand, and the leg. The march of the paralysis was clearly leg, arm, face—the leg being first affected. The knee-jerks are brisk and Babinski's sign is present. No affection of sensation. No retraction of head. There is a little foul pus in the right ear. Temperature 97.4°. Pulse 60.

Operation.—August 21st, the complete mastoid operation was carried out; cholesteatomatous material occupied all the cavities. On careful examination of the boundaries of the tympano-antral cavities, no visible tract of disease leading into the skull was discovered. The tegmina antri and tympani were then removed. Their upper surfaces did not appear diseased, but the dura exposed was not pulsating though it appeared natural, being neither softened nor altered in color. A knife was now plunged directly upwards through the exposed attic dura, making an incision ½ an inch long, and a large quantity (℥ iii at least) of pus escaped. A probe showed that the cavity in the brain extended forwards to the tip of the temporal lobe and backwards into the occipital. A narrow gauze wick was carried into the abscess cavity for drainage and the wound dressed in the ordinary way.

Convalescence was uninterrupted. A hernia formed not larger than half a walnut. By September 20th, the child was practically well and was rapidly gaining flesh.

The organism causing the abscess was bacillus coli communis.

Mr. C. A. Ballance. A case in which **a ragged opening in the dura was closed by an epithelial graft.**

The patient, a male aged fifty-nine, was admitted to St. Thomas's Hospital upon May 7, 1901. There was a history of double-sided otorrhœa of many years' standing. Pain in the left ear, headache, and vertigo had been frequent. The inner portions of the left auditory meatus were found blocked by masses of granulation tissue.

Upon May 8th, a complete mastoid operation was performed. Cholesteatomatous debris and fœtid pus were found in all the cavities. The osseous roof of the antrum and attic had disappeared, and the dura in these regions was soft and granulating.

Upon May the 24th, epithelial grafting was performed. Since the previous operation, the patient had looked ill and had had a good deal of vertigo and headache. **A ragged hole one-third of an inch in diameter was found in the dura over the attic, through which the brain was visible.** A little clear fluid escaped through the opening; the graft was arranged to cover this opening. Upon June the 7th, the plugs retaining the graft were removed, and a day or two later the patient left the hospital cured. Upon November 16th, the patient reported himself as quite well and the area covered by the graft was seen to be visibly pulsating.

Mr. F. C. Abbott. A case of rapidly growing **carcinoma of the auditory meatus.**

The President commented on the fact that the growth in the present case did not appear to have started in the tympanic cavity as it was met with in nineteen out of twenty cases. The point of origin seemed to have been at some part of the auditory meatus. He had never seen a case in which malignant disease had started in that situation, and such instances must be exceedingly rare, *i. e.* with a healthy membrane and a healthy middle-ear. He had seen growths originate in the tympanic cavity in the case of an old perforation, within as well as outside the mastoid process, on the skin.

Mr. Cheatle reminded the Society that Dr. Bronner had shown two cases, and he had himself shown one last session. Mr. Abbott mentioned that his patient went to Golden Square, where the growth was mistaken for a furuncle. In his own case, the growth began in the meatus and was a glandular carcinoma; it looked very much like a furuncle and he incised it. When it developed a little more, he saw what it was and removed the whole meatus.

Dr. Bronner said it made a great difference, from the prognostic point of view, whether the growth came in the middle ear or in the external ear. The two cases on which he had operated were both alive.

Dr. Milligan said he had seen altogether three cases of carcinoma in the external meatus. One was very much like that shown by Mr. Abbott that afternoon—a large fungating mass in the right ear. The growth had eroded the carotid artery and the patient died from hemorrhage. He asked Mr. Abbott whether he proposed to operate on his case, and if not, whether he would entertain the idea of injecting formaline into the growth with the idea of bringing about sloughing of a part of the growth and a consequent mitigation of pain.

Mr. Abbott in reply said that since he had come to the conclusion that the fluid which exuded was probably cerebro-spinal fluid, and that the temporal bone was eroded, he had decided that any radical operation was out of the question. He, however, thanked Dr. Milligan for the suggestion as to injecting formaline into the growth with the object of relieving pain, and he would carry it out.

Mr. Waggett said that years ago as house surgeon he had to do with a case which was very much relieved by the injection of pyoktanin. The case was published in the *Journal of Laryngology* about the year 1894 or 1895. The patient certainly died a comfortable death under the treatment.

Mr. Fagge said he thought the growth was allied to rodent ulcer, and suggested the use of X-rays in the case. He had known a rodent ulcer so treated to disappear almost entirely.

Mr. Yearsley said he had recently seen a very large carcinoma, which was under the care of Mr. Bryant, much benefited by the X-rays.

Mr. A. H. Cheatle. A case in which an **abnormal membrane** was present **in the osseous meatus.**

G. C., male, aged twenty years, came to King's College Hospital November 2, 1901, complaining of deafness in both ears, the left ear being the deafer of the two. Fifteen years ago, after an attack of measles, the left ear had begun to discharge and had discharged off and on ever since. The right ear had never discharged, nor had he ever had earache upon that side. There was no history of any injury to the right ear and it had never been syringed. It had begun, however, to get deaf four years previously, when he was taken to Golden Square Hospital to have adenoids removed. On examination, a flaccid bluish-gray membrane stretched wholly across the auditory meatus one inch from the tragus, the auricle being undisturbed. On depressing the membrane with a Siegle's speculum, he could bulge it out again by performing the Valsalvan experiment. On catheterization, a normal sound was heard. On the left side the membrana tympani was almost entirely destroyed. The hearing power with a 24-inch watch was R. 1 inch, L. ¼ inch. There was no nerve lesion.

The PRESIDENT regarded the membrane as consisting of cicatricial tissue.

Dr. MACNAUGHTON JONES **related the details of a case where a membrane was found stretching completely across the meatus.** Owing to an attack of pain this membrane was excised. No tympanic membrane was found behind it.

Dr. SCANES SPICER regarded the membrane as a much distended and blown-out membrana tympani.

Dr. W. HILL had lately seen a very similar case where a glistening membrane was stretched across the meatus close to its external orifice.

Dr. MILLIGAN considered the membrane to be of congenital origin—a congenital web.

Mr. URBAN PRITCHARD showed a **specimen of aspergillus.**

Mr. WAGGETT said nearly all the cases he had known had come out of London mews, and they would thus appear to have some relation to manure and stables.

Mr. PRITCHARD in reply said he had not been able to detect any uniform causation, and the subjects of the condition were from all occupations and all parts.

Mr. C. H. FAGGE showed a specimen of **tuberculous disease of the temporal bone.**

A. O., thirteen. No family history of consumption or other tuberculous lesions. Healthy until 1899, when she had scarlet fever. After this right otorrhœa began and persisted, though she attended Guy's Hospital, where polypi were removed and antiseptic syringing carried on consistently. In July, 1900, she had for a few days right facial paralysis and a second attack followed in August. When seen again in September there was no paralysis, but an indistinct hard swelling was made out below the right lobule and the otorrhœa was undiminished. On Sept. 7th, in the Evelina Hospital for Children, I performed the radical operation on the right side, and on cutting down on the swelling below the ear found a circumscribed abscess connected with the middle ear by a sinus piercing the outer half of the floor of the middle ear. This was curetted and some bone between the abscess and the middle ear removed, the cavity being allowed to granulate. This sinus healed early in October, but as the middle ear became covered with epithelium it softened and discharged watery pus once or twice. In March, 1901, there were still granulations on the floor of the middle ear. About Whitsuntide, 1901, when not under observation, right facial paralysis again set in and the middle-ear suppuration again was lit up. Mr. Abbott, in my absence abroad, kindly admitted her and opening the postauricular abscess curetted the whole area. The child was now very thin and pale and suffering from enlarged right cervical glands. Mr. Abbott diagnosed a generalizing tuberculosis because of remittent temperature, 102.8° to 97° F., and optic neuritis. In July, 1901, as the glandular enlargement had much increased, although patient's general health had again improved, I excised all the enlarged glands, dividing the sterno-mastoid. Many of the glands were suppurating and in parts showed discrete tuberculous foci. Her temperature ranged between 103° and 98°, the optic neuritis was less marked, but though she ate and slept well she gradually wasted. On August 26th (33 days after operation), she had a convulsion with unconsciousness and some twitching of the left side of the face. On the 29th, double optic neuritis was well marked, numerous adventitious sounds in chest, temperature 104° to 97° F. September 2d, patient died, having been unconscious for the last twenty-four hours.

At the autopsy found tuberculous enteritis, tabes mesenterica, and general miliary tuberculosis of the lungs and meninges.

The right temporal bone shows a smooth bone cavity resulting from the radical operation, the facial canal is opened in its descending limb, the promontory is carious, exposing the first turn of the cochlea, and a large portion of the carotid canal is opened up.

III.—REPORT OF THE TRANSACTIONS OF THE NEW YORK OTOLOGICAL SOCIETY.

MEETING OF NOV. 26, 1901.

By H. A. ALDERTON, M.D., SECRETARY.

The President, Dr. H. KNAPP, in the Chair.

Dr. KIPP presented Professor Trautman's set of **models illustrating steps of operations on the mastoid,** showing the exposure of the semicircular canals, antrum, sigmoid sinus, etc.

Dr. WHITING **presented a drawing** illustrating the **extraordinary development of the cells at the posterior root of the zygoma** in a mastoid process of pure pneumatic variety. He removes such cells as a matter of routine in all his mastoid operations, and finds the procedure to offer practical immunity against secondary operation to induce healing.

Discussion.—Dr. GRUENING agreed that it was wise to open these cells. Dr. ADAMS reported a case in which he found cells in zygoma and tip of mastoid in secondary operation. Dr. DENCH thought cells might develop in opposite direction to occipital bone, and he believes in following these cells to their termination ; also every vestige of cell tissue should be removed. Dr. GRUENING thought last statement too radical ; he believes in removal of all diseased tissue only. Dr. ADAMS agreed with last view. Dr. QUINLAN asked Dr. Gruening how he tells normal cells macroscopically. Dr. GRUENING said any one can tell a healthy cell. Dr. DENCH said that he did n't mean to take out everything, but believed in exploration and would follow the course of well developed cells. Dr. H. KNAPP said that we should proceed intelligently. Diseased zygomatic cells are specially found in children where those of mastoid are not yet developed. Dr. WHITING said that his drawing shows all the cells spoken of by Dr. Dench ; those in the occipital bone being well marked. He often finds pus in antrum, then healthy cells between antrum and pus in the tip. He thinks the pus spreads through the veins and lymphatics and not by continuity of tissues. Dr. GRUENING remarked further on non-utility of too extensive destruction of cells. Thinks an occasional possible secondary operation preferable to being too radical.

Dr. SHATTUCK **showed an apparatus of Dr. Alderton :** to a long Ballance chisel or gouge, one pole of a galvanic battery is attached by means of a binding screw, the other pole being applied by a sponge to the neck of the patient operated upon for mastoiditis; the idea being that the electrical current will produce a nerve reaction of the facial before the integrity of the nerve is attacked, while ordinarily the nerve is injured at the time of such reaction. It is especially designed for use in radical operations on eburnated bones.

Discussion.— Dr. WHITING wants to know its use. Dr. SHATTUCK: To determine the proximity of nerve. Dr. WHITING thought it not necessary, as we know when we get near the nerve and get reaction any way. Dr. KIPP agreed. Dr. H. KNAPP thought the idea a good one, and should be tried.

Dr. C. J. KIPP **reported a case of Ménière's symptom-complex** in connection with mumps in an adult. A physician about forty years of age, whose ears up to this time had been normal, noticed on May 19th a slight swelling under right ear with pain. No attention was paid to these symptoms, and although the day was unpleasant regular business was attended to. In the evening of this day there were slight chilliness and a temperature of 101 °. May 20th, the swelling increased slightly and there were some fulness and slight deafness. May 21st, these symptoms were more marked and continued until May, 23d. On the morning of the 23d plans had been made to go to the country for the summer. Upon rising from the bed, he was taken with a sudden attack of vertigo and pitched head first into the bed. This attack was followed by nausea and vomiting and by purging. However, the trip was taken, although the nausea and dizziness were continuous and caused great discomfort. Upon reaching the country place, he was compelled to go to bed and for ten days could not lift his head from the pillow. The ceiling, when he looked at it, appeared to be falling on him, and the floor had a tendency to fly up. The only treatment was the use of calomel, and large doses of quinia. The sounds in the ear were of all kinds from the clanging of bells to the blowing-off of steam. The pulse rate was as low as 44 but the average was 48. The dizziness continued for a long time and did not wholly disappear until November, and even now walking in the dark is a little uncertain. The tinnitus still continues, but the tone is low, and is more bearable than it was. The deafness is total.

Discussion.— Dr. DENCH had seen several cases of labyrinthine disease following mumps, in which the internal administration of pilocarpine in full doses had caused a complete restoration of the hearing. He cited one instance, in which the administration of the drug had been followed by especially satisfactory results. In this instance, the child did not come under observation until several months after the attack of mumps. Dr. DENCH thought that the administration of pilocarpine was always indicated in these cases, and that the prognosis was fairly good, excepting where the complicating aural lesion had existed for a long time before coming under the observation of the otologist. Dr. H. KNAPP thought the trouble to be metastatic. His cases were nearly always *one-sided* as was Kipp's case.

Dr. GRUENING **reported a case of meningitis serosa:** child æt. two ; 16 days, vomiting, eyes drawn up, fever, discharge from L. E. R. E.: *Mt* bulging, opened and evacuated pus. Pneumonia present. Temp. 103.8°. For 21 days temp. ranged from 105° to 98.6°. Facial paralysis. Operation without anæsthesia : the right mastoid was opened in usual way. Left mastoid also operated upon ; whole mastoid process was destroyed to sinus. Tegmen carious, also ossicles. Dura not discolored. Knife was carried ⅛ inch through dura, with result of three or four ounces of serous fluid. Child well now.

Discussion.— Dr. DENCH recalled similar case that he had published. Dr. WHITING had two cases : good result in one with healing and return of symptoms, second operation revealed so large amount of fluid that when it was evacuated the dura lay in folds—recovery ; 2d case was also operated upon and recovered. Dr. MCKERNON asked as to color of fluid, because of a similar case operated upon without good results—*i. e.*, died. P. M. showed lepto-meningitis. Answer—colorless.

Dr. DENCH **reported briefly a case of syphilitic inflammation of the labyrinth.** The patient was a groom, about thirty years of age. Some months before coming under observation, he had contracted a cold, and became deaf in both ears quite rapidly. Before Dr. Dench saw the patient, the latter had been put upon large doses of potassium iodide by his medical attendant. A careful examination, by an eminent dermatologist of this city, failed at first to reveal any evidence of specific infection. Owing to the fact that the deafness came on very rapidly and was profound, the speaker was inclined at first to believe the symptoms due to a constitutional infection. Functional examination revealed the entire absence of bone-conduction on both sides, a slight elevation of the lower tone-limit, and a normal upper tone-limit. Owing to the fact that the patient had been suffering from a severe influenza, and for the reason that the hearing was slightly improved upon catheter inflation, the case was treated as one of tubal congestion for two or three weeks. At the end of this time, the case was again examined by a syphilographer, and distinct evidence of constitutional infection was found. The patient was then put upon hypodermic injections of mercury, and, at the same time, was given pilocarpine by the mouth, until the full physiological effects of the drug were obtained. In about a week the improvement had been so great as to enable the man to resume his former occupation as coachman.

Discussion.— Dr. BERENS uses inunctions of Hg. and gives K. I. Dr. KIPP for early cases omits Hg., using only K. I. Dr. TOEPLITZ recalled similar case in which disturbance of hearing preceded roseola. Dr. BACON thinks that great care should be used in administering pilocarpine on account of its depressing action, and that before resorting to this drug the patient should be given mercury and iodide of potash, for some cases of deafness are relieved by the mixed treatment or by large doses of iodide of potash. When it becomes necessary to use pilocarpine, it will be necessary frequently to give it for two or three weeks before any improvement in hearing will be noticed.

Dr. ARNOLD KNAPP **reported a case of isolated disease of the external semicircular canal complicating the course of acute mastoiditis.** The case was one of purulent otitis when the mastoid was opened on the fourteenth day of the disease, Aug. 11, 1899. Owing to a persistent mastoid sinus, another operation was performed on May 14, 1900, at which the external semicircular canal was freely exposed. On Aug. 7th, vertigo set in. On Sept. 21st, after removing granulations from depth of wound, a distinct grayish-black line was visible, running horizontally in the centre of the external semicircular canal, the translucent lumen. Cocaine or the probe applied to this region produced a severe attack of giddiness. Hearing normal, distressing tinnitus, nystagmus not observed; unfortunately, this last symptom was not especially examined for. Vertigo ceased in December (four months' duration). On Dec. 21st, the black line was no longer visible. The wound, however, would not close and the third operation took place on Feb. 21, 1901. The horizontal canal could not be recognized as such; the outer wall of the aditus was carious. After removal, most of the body and the horizontal process of the incus were laid bare. The wound then closed and healing was complete on Oct. 1st, with normal hearing. The case is of interest, as it shows that "translucent lumen" may occur in acute cases, in the absence of cholesteatoma, and does not necessarily imply involvement within the labyrinth nor demand surgical intervention when unaccompanied by other labyrinthine symptoms.

Dr. McKernon **reported a case,** male, thirty-two years old, alcoholic subject. Seventeen months previous, after full dinner with wine, awakened deaf in both ears. Had taken K.I. in large doses for seventeen months and Hg., K.I., and pilocarpine. Vertigo to left and movement of head to left. Absolutely deaf in both ears by bone-conduction to C 128 minus. Syphilitic infection. Could get absolutely no evidence of syphilis. Given ¼ gr. t. i. d. of pilocarpine for six weeks, with improvement. Pilocarpine increased to gr. ½ hypodermically. Dr. McKernon thinks over-stimulation by alcoholics caused rupture of blood-vessel in labyrinth.

Discussion.— Dr. Bacon asked as to the condition of patient, to illustrate how well pilocarpine is borne. Answer—patient has lost 10–12 pounds in weight but feels well. Dr. Gruening asked as to condition of heart. Dr. McKernon answered 86 beats and regular. Dr. Whiting asked if Dr. McKernon thinks the effect will continue so diaphoretic. On administration of gr. ½ in a case of his, the patient became tolerant to the drug. Dr. McKernon said tolerance is established; he also said that bone-conduction was improving.

Dr. Brandegee **reported a case of mastoiditis,** in an infant five months old. Baby's sister had measles which prevented the admission of the baby to the New York Eye and Ear Infirmary. He was uncertain what to do with the child. Telephoned to the Willard Parker Hospital, which refused admission because child itself was not infected, and to other institutions, which refused because the child had been subject to infection. The doctor then operated upon child, and sent it home; the case did well.

MEETING OF JANUARY 28, 1902.

By ARNOLD KNAPP, M.D., Secretary.

The President, Dr. H. Knapp, in the Chair.

Dr. Pyle presented a patient who had suffered from old **otorrhœa; vertigo and right facial paralysis** had recently set in.

A radical operation was done, the mastoid was found sclerosed, the antrum and attic enlarged and filled with cholesteatomatous masses, the ext. semicircular canal eroded. The patient was treated with the battery two weeks later and recovered in six weeks.

Discussion. — Dr. McKERNON asked what form of current was employed?

Dr. PYLE: Constant galvanic current with interruptions.

Dr. GRUENING thought that the case could not be regarded as cured. The canal was very narrow and filled with discharge.

Dr. H. KNAPP described a recent operation which was somewhat similar to the one just presented, where he had operated according to the Stacke method. He thought that there was a decided indication for this form of operation in certain conditions — sclerosed mastoids.

Dr. ROBERT LEWIS, Jr., **presented a case** of a young woman who had consulted him on account of a nasal lesion. In the course of his examination he had learned that in her early childhood she had had a very profuse discharge from both ears, accompanied by much pain. There had been no discharge, however, for a number of years past. On examination with the speculum and the reflected light it was found that on the right side there was complete absence of the tympanic membrane, of the ossicles, of the posterior bony wall of the auditory canal, and of the cellular structure of the mastoid process. The external auditory canal, the middle ear, and the excavated mastoid process together formed one large cavity lined with epithelial membrane. The inferior wall of the external auditory canal continued on into the mastoid cavity without the presence of the slightest ridge to indicate where one ended and the other began. The cavity of the cell at the tip of the mastoid was easily seen through the enlarged external meatus, and evidently nothing but the shell of the mastoid process remained.

The case is interesting largely because it exemplifies, in a thoroughly ideal manner, how nature can perform a complete radical operation in much the same way as is accomplished by the surgeon who follows the Stacke method.

Discussion.—Dr. KIPP had observed bilateral exfoliation of the entire mastoid process.

Dr. H. KNAPP drew attention to the cases of spontaneous cure of cholesteatoma with exposure of all the middle-ear cavities. He said such cases had been described by Körner in the ARCH.

OF OTOLOGY several years ago. He had seen a few of them himself; he particularly recalled one in the service of Dr. Rich. Jordan at the New York Ophthalmic and Aural Institute. At the bottom of a wide ear-canal was a large cavity occupying the spaces of the drum cavity, together with the attic and antrum, lined with grayish-white walls such as we notice only after the most successful radical operation. There had been no perforation of the mastoid. I suggested to Dr. Jordan to put the case on record, but he was of opinion that the observation was not rare enough.

Dr. H. KNAPP **presented a young lady** who had had scarlet fever when three years old. Right otorrhœa until the age of six. October 4, 1901, she came to Dr. K. with her family physician. Two months previously the right ear began to pain. The canal wall had been incised several times by another aurist, viscid liquid escaped, then the auricle swelled.

On examination there was found an extreme case of **perichondritis:** puriform discharge, the auricle perforated and drained by a band of gauze passed through the auricle from in front back. The misshapen auricle was enlarged, soft in places, hardish in others. Dr. K. treated it like a carious mastoid: free incision through the whole thickness of the auricle, 3 to 4 *cm* long, and removal with a sharp spoon of all diseased tissue, viz.: granulations, necrosed debris of cartilage, inspissated pus, viscid and purulent discharge, leaving the remnants of healthy-looking cartilage. The large wound was dusted with iodoform-boric-acid powder, a gauze strip was passed through the thickness of the auricle, and drawn downward under the skin at the anterior side. The swelling and discomfort at once diminished, mostly on the anterior side. Nine days after the operation, Dr. K. made an incision into the soft upper and posterior side of the auricle, scraped and cleansed the upper part, passed the sharp spoon under the skin of the middle portion, cleansed a canal running down to the lobule, made a counter-opening at the lower end of the fistulous passage, and inserted a long, perforated silver tube, 3 *mm* in thickness, through the upper opening under the skin at the posterior side out of the lower opening. This gave excellent drainage; the recovery, at once visible, was virtually completed; when, two weeks after the second operation, the tube was left off, there was no discharge any more, and the extensive and nodular swelling of the auricle gradually became less conspicuous.

The disfigurement, after so large a deformity, is comparatively small; the principle in the management of such cases is analogous to carious mastoiditis: thorough exposure and removal of all necrosing parts, free drainage, and mild compression.

Supplement.—Soon after her presentation to the Society the young lady came to the doctor again to have the disfigurement of the auricle made still less conspicuous. Dr. K. at once complied with her request and improved the shape of the auricle considerably by exsecting a prominent round piece of thickened skin which filled the concha. After its removal, which was recovered from in a week, an excavation, occupying the site of the concha, made the auricle appear more natural.—ED.

Discussion.—Dr. GRUENING said that he had seen this patient in an early stage where it had been difficult to say whether it was a mastoiditis or not.

Dr. PYLE had recently observed a post-operative case which was treated by making an incision along the convex border of the auricle.

Dr. GRUENING thought that in the early stages transfixion and the passing of a drain was sufficient.

Dr. QUINLAN related the case of an adult who had plucked a hair from the scaphoid fossa. Extensive swelling followed in two days, furuncular in character, later involving the tragus, helix, and other cartilaginous structures. The case had to be incised and pus evacuated; posterior incisions were also made and wicks of gauze were left in for two weeks for drainage. The wounds healed in a short time.

Dr. KIPP thought that perichondritis after operations was the result of cutting too far into the concha.

Dr. CHARLES J. KIPP reported a case of **spontaneous cure of an objective vascular tinnitus of five years' standing.**

Mrs. I. A. L. American, aged thirty-five, large stout woman, otherwise in excellent health. Has never been seriously ill. Six months ago she fell on coccyx, but does not remember whether or not head was hurt. For two months, constant buzzing in left ear. Was first seen by me on July 19, 1878. I found that the hearing of left ear was not impaired either for voice or tuning-fork. The external auditory canal was roomy and apparently entirely healthy. The drum membrane was slightly opaque and depressed, but not more so than the right ear. The Eustachian tube was easily permeable. She complained of a dreadful noise in the left ear only. Auscultation failed to discover any sound in ear. The ophthalmoscopic examination was negative. A week later I saw her again and at this time I could hear a loud rasping noise all over left side of head, synchronous with the pulse. The sound disappeared entirely on compression of the left carotid. I advised her to consult a general surgeon, and she saw the late Dr. Willard Parker, who made the diagnosis of intracranial aneurism and advised ligation of the left carotid artery. She refused the operation, and I did not see her again till March, 1884, six years after her last visit to me. I found at this time the condition of the left ear just as before; the noise just as before. She has now also a noise in the right ear, but it is not as loud as in the left, and to obtain a rest from this terrible noise, as she describes it, she is obliged to compress both carotids. At this visit she stated that she was struck by a man on the left side of the neck the day before her first visit to me, and that the noise was first heard immediately after she received the blow. The ophthalmoscopic examination showed healthy condition of both eyes. Venous pulsation, which had not previously been noticed, was discovered at this time. I advised intermittent compression of the left carotid artery, and prescribed iodide of potassium in gradually increasing doses. About six years ago I met the patient casually and was told by her the noise had ceased. To-day, January 28, 1902, I had an opportunity to examine her again, and found on auscultation that the noise was absent. Not a trace of it remained. The hearing of the left ear was perfect.

In several similar cases on record, the carotid was ligated, but the noise, which ceased immediately after the ligation, returned a few hours later. I have called this a case of spontaneous cure, though it is not improbable that the intermittent compression of the carotid, which was persisted in for years, may have contributed to the cure. As to the nature of the lesion which caused the noise I shall make no guess.

Some years ago I published the report of a case in which, in addition to the bruit, there was present pulsating exopththalmos, also of traumatic origin. All symptoms entirely disappeared in the course of a year, under intermittent compression of the carotid artery and the administration of iodide of potassium.

Discussion.—Dr. EMERSON said that he had reported a similar case with exophthalmos twelve years ago, which got well, though the optic nerve atrophied.

Dr. DUANE asked when the pressure was applied to the carotids. Answer—About one hour each evening.

Dr. QUINLAN had occasion recently to apply adrenalin to the nose of a patient who happened to be suffering from tinnitus due to vascular causes. The tinnitus disappeared. The case was only under observation for three weeks, but during this time under its use it did not return. The doctor thought it was due to the vaso-motor constricting action of the drug.

Dr. GRUENING drew attention to the fact that he had reported a case in 1876, where the noises had ceased after ligature of the carotid.

Dr. HARRIS asked if treatment had been kept up all these years. Answer—No.

Dr. EMERSON had seen a woman with normal hearing who suffered from tinnitus at menstruation.

Dr. BRANDEGEE inquired how long relief lasted after pressure was applied. Answer—Could not state exactly.

Dr. GRUENING, in a recent epidemic of **measles,** had observed some peculiar cases of **otitis with complications,** of which the two following cases are examples.

1. A child had been ill for two weeks, then pain in the ear developed with fever. After paracentesis there was discharge, but the fever continued. There were no typical symptoms of mastoid involvement. Two days later there was bulging of the drum, slight mastoid tenderness over the antrum. The mastoid process was then opened and most extensive destruction found. The child died.

2. The second case was in a girl seven years old. Measles one week, then pain in the ear, bulging of the drum; incision. The fever continued between 100° and 102.5°. No typical mastoid symptoms; perhaps slight tenderness. Guided by the previous case it was decided to operate. The entire mastoid was found destroyed. The patient recovered.

Discussion.—Dr. DUELL had found that mastoiditis accompanying measles occurred generally in cases where the measles was complicated with another infection.

Dr. HARRIS had recently operated on the mastoid in a case of light measles and had found a subperiosteal abscess.

Dr. PYLE had seen many cases of measles and scarlet fever without mastoid complication while in general practice. Lately, however, he had seen a severe bilateral case with one-sided facial paralysis.

Dr. McKernon had had the same experience as had Dr. Gruening, and quoted the case of a child, aged six, where double otorrhœa set in eight days after measles and then ceased. There were no typical symptoms except slight antral tenderness. The mastoid contained a great deal of pus. Two days after this operation the temperature rose to 104°, with stupor. The other mastoid seemed tender and when opened was very extensively involved.

Dr. Adams asked whether the case occurred in active measles. Answer—No, it occurred on the eighth day.

Dr. Pyle asked what treatment should be recommended to the general practitioner. Dr. Gruening thought it was first of all necessary for the practitioner to be able to inspect the drum, otherwise he advocated absolute rest and warm water and paracentesis, but not leeches nor the ice-coil.

Dr. Emerson thought he had seen very good relief from leeches and did not see why they should be given up.

Dr. Gruening replied that the leech bite often caused tenderness, thus masking the only diagnostic sign of mastoid involvement. He also thought it was sometimes difficult to check the bleeding.

Dr. Quinlan related briefly the case of an adult who had suffered from measles, then pneumonia, and, finally, acute catarrhal otitis, terminating in a post-auricular abscess, which had to be opened. The mastoid was found the seat of a granulating tissue and pus.

Dr. McKernon related the further progress of the **case of labyrinthine deafness** which he had reported at the previous meeting. He said that with large doses of pilocarpine the hearing had now become nearly normal. The drug was administered hypodermatically, beginning with ⅙ grain and gradually increasing to ¾ grain three times daily, the patient being in bed. He had later discovered a syphilitic history and had administered potassium iodide, 60 grains three times a day, the entire treatment lasting eleven weeks.

Dr. Wilson said he had seen very bad results after an initial dose of ¼ grain of pilocarpine.

Dr. Adams **related the case** of a woman who had applied to the Hudson Street Hospital with profuse bleeding from the nose. This continued about a week, when it was noticed that the ear was bleeding. On examination, patient was found to have a bloody bleb on the anterior surface of the external auditory canal.

When this was removed there was found a thickened drum. No other spots of hemorrhage were visible and the drum was intact. No evidences of traumatism and no history of fracture of the base. Patient was a bleeder.

IV.—REPORT OF THE TRANSACTIONS OF THE SECTION ON OTOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

BY DR. J. A. KENEFICK, SECRETARY.

STATED MEETING HELD DECEMBER 11, 1901.

President, Dr. JAS. F. MCKERNON, in the Chair.

Dr. B. A. RANDALL, of Philadelphia, the invited lecturer of the evening, read a paper (with lantern demonstrations) entitled: **Notes on the Teaching of Otology.**

I venture, Gentlemen, to take up the question of methods of otological teaching, not with the idea of presenting anything new, but in the hope that some of my methods may prove of use to many of you who are similarly engaged, as supplementary to those which you are now successfully employing. My prime idea, especially with graduate men, and to a considerable degree with the undergraduates, is to present those elements of the branch which they are less likely to obtain correctly from the text-books, or which they might not pick out as fundamental in studying out the topics as there presented. Believing that otology like all surgical branches is a combination of anatomy and common sense, the presentation of the clinical anatomy constitutes first, last, and all the time the ground-tone of my teaching, and I endeavor particularly to correct the pieces of misinformation which are furnished by the majority of treatises.

The **auditory canal,** being the path through which we gain access to many of our ear cases, deserves a careful demonstration as to its curves, its length, and its general direction. In these and other elements the authorities have often been inadequately informed, so that they have laid down their descriptions upon too narrow a basis of observation, making hard and fast definitions where much variation is usual, and sometimes exploiting the exception rather than the rule. The great inclination of the drumhead at the bottom of the canal and its unvarying position throughout life are readily demonstrable ; yet needs even to ourselves constant reiteration in order to correct the misapprehension which clinical cases so frequently give us. For with the open canal and transparent drumhead we find it difficult to persuade ourselves that the inclination is in these cases as oblique as it manifestly is when through a narrow canal we study an opaque drumhead. The configuration of the canal and the drumhead margin (too often overlooked in examinations with the speculum with its restrictions of the visible field) has to be constantly reiterated and the student taught to carry an arbitrary ideal in mind, composite from many observations and not precisely borne out perhaps by any of the cases presented, yet a basis from which the physiological and pathological variations are easily reckoned, with constant ability in the briefest glance to obtain an instructive view embracing a large number of minute yet possibly important details.

In this connection, I find colored models extremely useful as affording by relief the configuration which drawings alone sometimes fail to present, while the color gives a verisimilitude which Politzer's similar plaster models fail to present. The corrosion-casts of the nasal passages and the tube-mouth region offer a demonstration of this disputed territory, and serve as frequent helps in relation to its treatment ; and such models as those issued in Würtlemberg are even better than the wet preparations for the teaching of catheterization. For the presentation of the topic of tuning-fork diagnosis, I find diagrams extremely convenient, particularly in the form of roller charts ; while for the illustration in systematic order of the various anatomical and pathological conditions, the projection-lantern is of course one of our best methods. In this connection, the less usual plan of using the electric light with its intense illumination to throw the picture through a fine transparent screen of the architects' linen enables one to use it without darkening the auditorium, and makes it a better servant, less masterful of the convenience of teacher and class.

As a pupil of Politzer I naturally employ quite commonly those methods of clinical instruction and individual demonstration upon the patient which are a feature of his teaching, with constant comparison with the anatomical specimens which explain the clinical pictures ; and I drill the men in those manipulations of mirror, probe, syringe, and pneumatic speculum which have seemed particularly useful in my own practice. For the larger groups I employ the electric otoscope, which furnishes excellent illumination without delay and permits the demonstration of individual cases to a larger number of students, without undue fatigue to the patient. The operative technique, so difficult of demonstration to any considerable group of students on the living patient, or even on the cadaver, can be made clear by diagrams and on anatomical specimens ; I lay stress on the importance of fully labelling any specimens which pass from hand to hand, since the remarks made as to them have usually been long passed and perhaps forgotten before the specimen has passed half around the class. Instruments are fully demonstrated with the principles of their employment ; but I steadily refrain from any elaboration in this regard, and both in teaching and practice hold to the simplest appliances which are really efficient, insisting from first to last that hand, eye, and brain are the prime essentials and that instruments are wholly secondary, although they must never be cumbersome and obstructive. If there be a point as to which my teaching is peculiar, it is this endeavor to reduce all details to their simplest terms.

[These introductory remarks were followed by a long series of lantern demonstrations, with descriptions of the most important conditions of the aural anatomical topography in health and disease, the knowledge of which is so essential in diagnosis and treatment. The stereopticon views were mostly taken from Dr. Randall's extensive collection of valuable specimens, of which a goodly number were passed around. The numerous New York audience followed the Philadelphia lecturer with keen interest and evident appreciation.—H. K.]

Discussion.—Dr. WENDELL C. PHILLIPS : I have but little to say except words of commendation. It is indeed a pleasure to have been able to listen to the paper just read, and it has impressed me with the fact that those of us who are teachers, especially in post-graduate instruction, cannot be too painstaking in our work. I believe that the ordinary post-graduate student, who is usually a general practitioner, and who has come back to the city to learn some of the things that were neglected in his undergraduate course, returns not so much to get a knowledge of the intricacies of anatomy as to be enabled to make a diagnosis and to know how to treat his cases. Of course, we all understand that in order to make a proper diagnosis a man must have a knowledge of his anatomy. It has been my experience in teaching men in post-graduate institutions that I have great difficulty in getting them to study the rudimentary things which are so very important. One can hardly credit the fact that a very considerable proportion of the practitioners of medicine in America are not even able to make an intelligent examination of the drum membrane. Time and time again men who have been in the practice of medicine for ten, fifteen, or even twenty years, will come into my clinic and not be able to tell what they see when cases are shown them for demonstration. This is not a discredit to the practitioner, but to the institution from which he graduated. It is my experience that the undergraduate colleges of this country, until quite recently, have not given their students anything like adequate instruction in the treatment of aural diseases. It is to be hoped that that time has passed; I believe it has. Undergraduate institutions now do give their men better instruction and prepare them better for the practice of otology.

I endeavor to impress upon these men the fact that an acute suppuration of the middle ear should never become chronic if properly treated, and to outline the treatment facts like the above seem to me most important. Men who are preparing to become otologists should be taught anatomy by demonstrations on the cadaver, and only in small classes. I do not mean to belittle the study of anatomy, for I believe it is of the utmost importance; but it is extremely difficult to get men who have been in practice for a number of years to take up the subject of anatomy seriously. They will, however, take up the practical points, and a good deal of anatomy can be thus taught.

Dr. EDWARD B. DENCH: I have been extremely interested in all that has been said, and it has been a great privilege to be able to listen to the able discourse of Dr. Randall. I agree heartily with all that has been said regarding the study of anatomy. It certainly is very difficult to make some of our students realize its importance. In the early days of my experience as a teacher I believe that I talked too much on anatomy during the first four or five lectures of the course, and I found that when it came time for me to take up the subject of aural disease, I had a very small class present. Now I follow the plan of bringing in with the anatomy some practical points which are clinched in the student's mind by the citation of certain cases.

For a number of years I have used a large model, about four feet long, with ossicles about one foot high, which shows the various parts of the anatomy of the ear, and which can be readily taken apart. The model is hard, and represents a vertical section of the canal, enabling the students to see just how the drum membrane looks when it bulges into the canal. In order to fix upon their minds the appearances found in certain diseased conditions, the flexible drum-membrane is colored; in fact, it is a flexible black-board.

I was particularly glad to hear reference made to the double ball-jointed head mirrors.

Dr. FREDERICK WHITING: I have been greatly edified by the line of instruction Dr. Randall uses in his teaching. I observe that Dr. Randall teaches his students not only by mouth, but also by sight and touch, and I think the students of Philadelphia are to be congratulated in having such an instructor.

Dr. J. OSCROFT TANSLEY: I wish to congratulate Dr. Randall on his paper; it is worthy of the man, whom we all know as a conscientious and painstaking teacher. I think the question which should be raised here is, "Whom are we teaching?" Men who are engaged in country practice have not time to go into this matter very thoroughly; but if we are to teach men who expect to become specialists, then anatomy cannot too thoroughly be gone into, as Dr. Randall has stated. In my teaching experience of twenty years, my greatest trouble has been in endeavoring to hammer into my students the local anatomy; they will not take the necessary time. I think the best way to teach the students that come to us here in New York is to show them patients, the more the better; that seems to be the only way that we can hold them. If they are to become specialists, they should be taught anatomy, and this they themselves fully realize.

Dr. ROBERT C. MYLES: I think the Section on Otology is to be congratulated in being able to secure a presentation and a practical illustration of Dr. Randall's methods in teaching otology. I think we should divide the pupils into two classes: (1) those that graduated before the colleges gave much attention to this subject, and (2) those that have graduated within the past few years. Several years ago the students in our American medical colleges were taught by the older methods, and they

OF OTOLOGY several years ago. He had seen a few of them himself; he particularly recalled one in the service of Dr. Rich. Jordan at the New York Ophthalmic and Aural Institute. At the bottom of a wide ear-canal was a large cavity occupying the spaces of the drum cavity, together with the attic and antrum, lined with grayish-white walls such as we notice only after the most successful radical operation. There had been no perforation of the mastoid. I suggested to Dr. Jordan to put the case on record, but he was of opinion that the observation was not rare enough.

Dr. H. KNAPP **presented a young lady** who had had scarlet fever when three years old. Right otorrhœa until the age of six. October 4, 1901, she came to Dr. K. with her family physician. Two months previously the right ear began to pain. The canal wall had been incised several times by another aurist, viscid liquid escaped, then the auricle swelled.

On examination there was found an extreme case of **perichondritis:** puriform discharge, the auricle perforated and drained by a band of gauze passed through the auricle from in front back. The misshapen auricle was enlarged, soft in places, hardish in others. Dr. K. treated it like a carious mastoid: free incision through the whole thickness of the auricle, 3 to 4 *cm* long, and removal with a sharp spoon of all diseased tissue, viz.: granulations, necrosed debris of cartilage, inspissated pus, viscid and purulent discharge, leaving the remnants of healthy-looking cartilage. The large wound was dusted with iodoform-boric-acid powder, a gauze strip was passed through the thickness of the auricle, and drawn downward under the skin at the anterior side. The swelling and discomfort at once diminished, mostly on the anterior side. Nine days after the operation, Dr. K. made an incision into the soft upper and posterior side of the auricle, scraped and cleansed the upper part, passed the sharp spoon under the skin of the middle portion, cleansed a canal running down to the lobule, made a counter-opening at the lower end of the fistulous passage, and inserted a long, perforated silver tube, 3 *mm* in thickness, through the upper opening under the skin at the posterior side out of the lower opening. This gave excellent drainage; the recovery, at once visible, was virtually completed; when, two weeks after the second operation, the tube was left off, there was no discharge any more, and the extensive and nodular swelling of the auricle gradually became less conspicuous.

The disfigurement, after so large a deformity, is comparatively small ; the principle in the management of such cases is analogous to carious mastoiditis : thorough exposure and removal of all necrosing parts, free drainage, and mild compression.

Supplement.—Soon after her presentation to the Society the young lady came to the doctor again to have the disfigurement of the auricle made still less conspicuous. Dr. K. at once complied with her request and improved the shape of the auricle considerably by exsecting a prominent round piece of thickened skin which filled the concha. After its removal, which was recovered from in a week, an excavation, occupying the site of the concha, made the auricle appear more natural.—ED.

Discussion.—Dr. GRUENING said that he had seen this patient in an early stage where it had been difficult to say whether it was a mastoiditis or not.

Dr. PYLE had recently observed a post-operative case which was treated by making an incision along the convex border of the auricle.

Dr. GRUENING thought that in the early stages transfixion and the passing of a drain was sufficient.

Dr. QUINLAN related the case of an adult who had plucked a hair from the scaphoid fossa. Extensive swelling followed in two days, furuncular in character, later involving the tragus, helix, and other cartilaginous structures. The case had to be incised and pus evacuated ; posterior incisions were also made and wicks of gauze were left in for two weeks for drainage. The wounds healed in a short time.

Dr. KIPP thought that perichondritis after operations was the result of cutting too far into the concha.

Dr. CHARLES J. KIPP reported a case of **spontaneous cure of an objective vascular tinnitus of five years' standing.**

Mrs. I. A. L. American, aged thirty-five, large stout woman, otherwise in excellent health. Has never been seriously ill. Six months ago she fell on coccyx, but does not remember whether or not head was hurt. For two months, constant buzzing in left ear. Was first seen by me on July 19, 1878. I found that the hearing of left ear was not impaired either for voice or tuning-fork. The external auditory canal was roomy and apparently entirely healthy. The drum membrane was slightly opaque and depressed, but not more so than the right ear. The Eustachian tube was easily permeable. She complained of a dreadful noise in to get up the next day and to increase his diet. On the morning following I received a telephone message saying that the patient had a temperature of 104° and had developed Cheyne-Stokes breathing, and a rapid and a feeble pulse. Before I could get to the hospital the patient died.

At the autopsy we found the following condition: The abscess occupied the right lobe of the cerebellum. There was a point about the size of the tip of the probe on the sinus wall which was carious and which was only found upon careful examination. The sinus was found to contain pus. The internal wall of the sinus was necrotic and led into a large abscess cavity. This case is very instructive, showing, as it does, how, in spite of the most careful operative technique, in certain instances such a condition may escape observation. There were no symptoms whatever until just a few hours before the patient's death, when the temperature suddenly jumped to 104° F. and the patient collapsed. Yet there was pus in the lateral sinus and an extensive abscess in the cerebellum.

This second specimen which I wish to present to the Section is interesting from several points of view. The patient from whom this was removed was a child about two or three years old, who was admitted to the hospital with symptoms of simple acute mastoiditis. In this case there was a small fluctuating mass posterior to the auricle. Incision revealed no pus. Upon entering the bone, soft tissue was found in the region of the antrum. This carious bone was removed and the patient then placed in bed. The child had not been under observation until the day of the operation, so I cannot tell you just what the character of the temperature chart was. Upon admission, his temperature was 101°, and ranged from that point to 102° during the next four or five days. Nothing was found in the chest which would account for the temperature. I did not pay much attention to this temperature, knowing, as I did, what slight disturbances may cause temperature elevation in a child. Everything seemed to be normal. The operation was performed on Monday, and on the following Wednesday, when the wound was dressed, the patient's condition still appeared to be fairly good. The bony walls were again explored carefully and no necrotic bone was found. On the Saturday following, five days after the operation, the patient's condition grew worse, the pulse and respiration becoming more rapid and the child very weak. I went over the chest but could find nothing to account for the symptoms. Dr. McKernon also looked over the patient's chest and found nothing. On account of the symptoms, it was thought that there might be some intracranial focus of infection; therefore, I did an exploratory operation. The lateral sinus was found to be normal. The dura over the middle cerebral fossa, above the external auditory meatus, was seen to be normal. Because the dura over the cerebellum looked congested I turned down a dural flap and bored in several directions but found no pus. In order to make perfectly sure, I introduced a director along the lines of incisions but found nothing. I then carefully sutured the dural flap, replaced the large cutaneous flap, sutured the angles with interrupted sutures, leaving abundant drainage over the dura. The child was then placed in bed. The temperature remained the same. On the following day the house-surgeon detected broncho-pneumonia on the left upper lobe, but the signs were not at all marked. The operation was done on Saturday, and on Tuesday the wound was dressed and considerable cerebellar substance had been forced out from beneath the dural flap. One or two superficial sutures were then removed to keep the parts aseptic. The child did fairly well until Friday, seven days after the exploratory operation, when the respirations ran up, the temperature remaining the same, and the pulse became weak and rapid. The wound was again dressed and there was found to be a good deal of brain substance coming from the exploratory opening in the cerebellum. A director introduced in several directions discovered no pus. I began to dress the wound and started to pack the sinus in the cerebellum with sterile gauze; as I was introducing the director and crowding the packing, suddenly there was a profuse flow of clear limpid cerebrospinal fluid. Of course I knew where that came from — the fourth ventricle. The wound was packed and the dressing applied and the child placed in bed. Two days later the patient died.

On autopsy, the brain was normal, except for some slight sanious fluid in the lateral ventricles. The fourth ventricle was perfectly normal. Examination of the walls of the cavity in the cerebellum showed the wound to be perfectly aseptic. The case is reported on account of the very obscure symptoms, the exploratory operation that was done, and the opening made in the fourth ventricle. Dr. Dixon made several smears and found everything aseptic. This is a case that shows that, under perfect technique, an exploratory operation can be done upon the brain with practically no danger.

Dr. Leszynsky: I should like to ask Dr. Dench what was the cause of death in the first patient presented by him.

Dr. Edward B. Dench: The cause of death was probably the extensive involvement of the parts.

I neglected to state in connection with the last case reported that the parents refused to allow any post-mortem examination beyond the cranial cavity. I suppose that patient died from the small patch of pneumonia, for there was nothing in the brain to account for his death.

Dr. Leszynsky: The question asked was prompted on account of the small size of the abscess cavity. It is not surprising that more symptoms were not caused by this abscess.

Dr. Dench: There were no signs of infection. The same morning the house-surgeon ordered the child out of bed. A temperature of 104° appeared and the child then collapsed. The history was very obscure.

Dr. George A. Dixon: I should like to correct the remarks made by Dr. Dench in regard to the sinus in the first case reported; the sinus was filled with pus and broken-down material. So far as the cause of death in the first case is concerned, it seems to me that there was a sufficient amount of pressure present to cause death, for the abscess was of large size.

In regard to the other case, I examined the walls of the abscess very carefully, making smears and looking for pus. Nothing was found, neither pus nor micro-organisms. If I had made a culture before placing the brain in any fluid I might possibly have found some micro-organisms of some sort. The latter case was more interesting to me on account of the fact that so much of the cerebellum was destroyed. The outer opening was of large size and a good deal of the cerebellum had been broken down and lost. As one passes forward and inward towards the fourth ventricle the canal narrows and the ventricle was entered from the side; its floor was intact. No pus was found either in the lateral or the fourth ventricles. The lateral ventricle was filled with a sanious fluid and there was a good deal of it. I do not think that the probe that was used went into the fourth ventricle. The pressure from within pushed the wall out considerably; even if the probe had reached that part of it I doubt very much if it would have entered the ventricle.

Dr. McKernon presented a **brain showing a temporo-sphenoidal abscess.**

Patient, Theodore Meyer, sixteen years of age. Upon admittance to the New York Eye and Ear Infirmary the mother gave the following history : The left ear has been the seat of an offensive discharge for twelve years. The condition followed and arose from an attack of measles. There have been several attacks of severe pain in this ear at different times—the dates and details of these attacks are not remembered, except that they came on after the discharge stopped or decreased in amount.

About three months ago there was an attack of pain in the left ear which passed away in a short time.

Six weeks ago there was general headache which has continued since.

Has had fever for about two weeks past, and during this time chills have occurred every other day. These have shown no tendency to periodicity in regard to the hour of the day.

The patient has been apathetic and drowsy for about a week, and for three days has been in his present condition—a dull, sleepy delirium.

For about a month he has frequently started suddenly in his sleep, yelling at the top of his voice, and as suddenly subsided again into sleep.

The parents have not noticed any stiffness of the posterior neck muscles, but the boy has this symptom at present.

For about a week he has not been able to answer questions intelligently.

Upon examination, from the left ear a purulent, thick, greenish discharge was found.

In each eye there was a choked disc of about two millimetres elevation, and retinal hemorrhages. The external rectus of each was paralyzed.

There was aphasia—both a tendency to misname things and an inability to state the names of articles with which he must have been familiar. He called a watch a clock, and then named it correctly ; a pocket-knife was called by some wrong name, and a key was not named at all though he said that he had seen one before and knew what it was. When asked his name he gave some address in Rivington Street.

After being in the ward about an hour, his respiration very suddenly became very bad ; and when, almost immediately afterward, he was seen by a member of the house staff, it had stopped altogether.

The pulse was fairly good, and remained so through the next two hours and a half while artificial respiration was done. When at the end of this time the movements were discontinued, the patient's respiration stopped and he became more and more asphyxiated, and about forty minutes later the pulse ceased to beat.

Autopsy.—Nine P.M. December 13th.

Body—no marks except ecchymotic spot 2½ inches in diameter about 2 inches below the middle of the right clavicle, and a small excoriation behind the left ear.

Dura perhaps somewhat thicker and more opaque than normal. Cortex cerebri somewhat congested, otherwise normal. Nothing in the superior longitudinal sinus or in the fissure. A soft spot found over the left temporo-sphenoidal lobe, and adhesions encountered over the tegmen tympani. These were quite firm and required considerable force to detach. In the attempt to remove the brain, an abscess in the left temporo-sphenoidal lobe was ruptured and a large quantity of greenish foul-smelling pus evacuated itself. Adhesions were also found farther back in the same lobe but not so firm as those first mentioned. When the brain was removed, a discolored spot was seen to occupy almost the entire outer aspect of the left temporo-sphenoidal lobe, and at a point below, say corresponding to the tegmen tympani, was a pale-looking spot with a depression, giving the impression of its having been the path of the infection. The abscess cavity was then freely opened, and the entire left temporo-sphenoidal and occipital lobes were found to be excavated and filled with pus.

A clear path of infection was demonstrated from the middle ear through an opening about $\frac{1}{16}$ inch in diameter in the tegmen tympani, in front of and to the outer side of the superior semicircular canal. The petrous portion of the left temporal bone was removed.

The pus showed mixed infection but no tubercle bacilli.

After hardening, the specimen sections were made and the abscess was found to have ruptured into the left lateral ventricle.

Dr. William H. Haskin presented a case of **mastoid neuralgia** in which resection of the mastoid was made and the wound cavity filled with paraffine and iodoform. This case came to the Manhattan Eye and Ear Hospital and was assigned to me about the middle of the month of November. The patient gave a history of having suffered pain for fourteen years in the mastoid; these attacks of pain alternated with discharge; when the discharge occurred the pain would cease. Everything pointed to a chronic inflammatory condition in the mastoid. The mastoid was painted with iodine until complete vesication followed, but there was no relief. There was a slight otorrhœa at the time; hot bichloride douches were given every two hours without relief. The patient was placed in the hospital and the ice-coil and leeches were applied. He was unable to sleep on account of pain, which was referred to the mastoid. Under the advice of Dr. Clemens, I operated upon the mastoid, making the usual incision. After going through the external plate the probe dropped into the attic. The cellular development was very extensive but everything was perfectly dry; there was hardly a drop of blood present during the removal of the bone. I then removed the entire mastoid and filled the opening made with paraffine and 30 per cent. of iodoform, closing the attic with dry iodoform powder in order to prevent the iodoform and paraffine passing into the attic. The wound was closed over the paraffine and the dressings applied in the usual manner. The operation was performed on the second day of December. That night there was no pain and the patient slept. After the fourth day she developed some frontal headache. There was no rise in the pulse rate or temperature. After the fourth day an examination of her urine revealed albumen and casts. At present there is a slight otorrhœa but no pain, and she is much better. The sutures were removed on the fifth day, union by first intention having been secured.

Dr. **Edward B. Dench**: The case reported by Dr. Haskin is certainly very interesting. I think the procedure of filling up the cavity with paraffine is novel. The only point that occurs to me for discussion, and what I do not understand, is, why is it necessary to fill the cavity with paraffine? We operate occasionally upon cases for pain in the mastoid region where we do not expect to find pus; I remember one instance where I operated for the relief of pain in this region, where I obliterated the entire mastoid and sutured the wound without filling it in with paraffine and the patient did well. If we have a clean wound there can be no objection to suturing the soft parts over the opening made, with or without any filling in with blood-clot. What the doctor has done shows conclusively that the paraffine was sterile.

Dr. **Herman Knapp**: It is a matter of record that cases of mastoid neuralgia can be operated on successfully by opening up the bone, and it is not even necessary to go so deep into it. If there is no infective condition present, primary union follows the immediate closing of the wound. I think it is more than fifteen years ago that I published the history of such a case in a young lady who could not go on with her school work on account of the pain in the mastoid region. The mastoid was opened but no pus was found; I then went deeper into the mastoid and wounded the sinus. As everything was clean, after the bleeding had ceased, I sutured the parts and obtained healing by primary union without any difficulty. The patient was cured and the history of her case was published by me a number of years ago.

Literature contains the histories of similar cases healed by first intention, after which the pain had permanently disappeared.

Dr. F. L. Jack of Boston presented a paper entitled: **Successful operation upon a case of brain abscess following suppurative middle-ear disease.**[1]

The study of brain abscess received fresh impetus in 1893 from the work of Macewen, which placed the subject on its proper plane, whether regarded from the scientific or purely practical standpoint. The prognosis has steadily improved. As against eight recorded successful operations up to 1889, Marsch found reports in 1898 of 60 successful operations upon temporal and 12 upon cerebellar abscess.

The exploratory operation proceeds in the direction of the temporo-sphenoidal lobe over the tegmen tympani unless cerebellar symptoms are present. The chance of relief by absorption or spontaneous discharge is too remote to justify expectant treatment.

Macewen states that operation through the tegmen tympani is inadequate for the thorough evacuation of the abscess. The following case proves an exception to this statement.

A newspaper reporter, twenty-five years old, has had otorrhœa during the past year, with one intermission. During six weeks before admission to the infirmary, complained of frontal headache; two days before admission, of severe headache and earache. Aural examination showed signs of acute inflammation with small amount of pus. The temperature was 101° F., falling to 99° F.; the pulse 60 to 70. Seven days after opening the drum, the patient had a chill and complained of intense frontal headache. The temperature rose to 102° F., the pulse to 90. **Extra-dural operation** through the sclerosed bone found the antrum filled with pus, softened bone, granulations, and purulent matter. The bone was removed over an area one inch in length and one-half inch in breadth. The lateral sinus was exposed for an inch. The dura was of a normal color and did not bulge. Bacteriological report showed mixed infection. Eight days later the patient was unconscious, with pupils contracted; the temperature was 98° F. and rose rapidly to 103° F.; the pulse 102, falling to 60. Convulsions appeared in the hands and arms. The patient was deeply comatosed during the four hours preceding operation.

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[1] Published in full in the *Boston Medical and Surgical Journal*, Dec. 26, 1901.

Intradural operation.—The bone opening was enlarged with chisel and rongeur forceps. Marked bulging of dura was found, but no opening through it. Introduction of the hypodermic needle into the brain revealed pus. An opening, made by a narrow knife and enlarged by forceps, evacuated four ounces of foul pus and sloughing brain tissue.

The temperature fell to 99° F. in twelve hours and the patient became rational. Removal of the wick was followed by discharge of about one-half ounce of fœtid pus. Improvement in physical condition and in mental state was rapid, but aphasia appeared and persisted. There was swelling of the optic discs, more marked on the left, but there was no hemianopsia. The patient was discharged practically well 27 days after operation. The aphasia disappeared in the course of another month.

REMARKS.—This case illustrates the fact that cerebral abscess does not necessarily produce bulging of the dura or abnormal appearance of this membrane; but in the absence of such signs it seems wise not to explore the brain unless definite symptoms of abscess appear.

The case shows also that separate opening of the squamous portion by trephine or chisel is not invariably necessary. The opening through the tegmen tympani has the advantage of lessening the danger of brain hernia, though this consideration should not deter the operator if any question exists as to the complete evacuation of the contents of the abscess.

Dr. G. L. WALTON, of Boston, contributed a paper entitled study of the **aphasia persisting during convalescence after evacuation of brain abscess.**[1]

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[1] Published in full in the *Boston Medical and Surgical Journal*, Dec. 26, 1901.

This subject has not received the attention from the neurological that it has from the otological point of view. Descriptions of the speech defect, with the exception of the report of Marie and Sainton, are brief, but all point toward sensory aphasia, particularly that of the auditory type. In the analysis of Dr. Jack's case answers were obtained to the thirty-four questions suggested by Bastian for systematic examination of aphasia. The results showed difficulty in understanding spoken or written language except the simplest, impairment of spontaneous speech (paraphasia), and difficulty in writing either spontaneously or to dictation. The difficulty in writing was practically identical with that in speaking.

The auditory word centre itself was not necessarily involved, for it is probable that the moderate word deafness was due to impaired conduction of the afferent fibres to the auditory word centre (subcortical sensory aphasia). The paraphasia may well have been due to imperfect conduction between the temporal convolution and that of Broca (conduction aphasia of Wernicke). The difficulty in recalling the names of objects seen and recognized was probably due to imperfect conduction through fibres connecting the visual and auditory centres, rather than to disorder of the visual centre itself. The difficulty in writing to dictation would indicate, according to Bastian, impairment of fibres passing in the opposite direction.

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This study, while showing the accuracy with which we may differentiate sensory from motor aphasia, illustrates our limitations in the attempt to establish the degree in which the different elements of the speech mechanism are affected in a given case. It also illustrates the justness of the position maintained by Collins and others, that the interdependence of the three centres renders the entire language zone liable to disarrangement upon disorder of any part of the mechanism. When we remember, further, that in most of these tests the patient is required to reproduce diverse associative memories, not only assuming integrity of fibres connecting the speech centres, but also of fibres connecting them with the entire association cortex, the futility becomes apparent of attempting to interpret the various defects by lesions limited to definite centres and definite groups of fibres passing to and from those centres.

This examination tends to corroborate the view that there is no writing centre in the sense of a centre in which are revived the kinæsthetic memories of written words, and which is capable of stimulation independently of Broca's convolution.

Discussion.—Dr. M. D. **Lederman**: In a very interesting and classical paper on brain abscess by Mr. Ballance, of London, he emphasized the importance of going into the brain structure with a knife, as a number of cases of brain abscess have not been found and have been passed through with an exploring needle which had not permitted the pus to flow. In another instance the needle had not gone through the abscess capsule.

With regard to drainage and the importance of drainage tubes, it is not advisable to irrigate unless the drainage is retarded. The drainage tube is preferable to packings of gauze, as the removal of same offers less disturbance to the delicate structure. The after-dressings are an important factor in the ultimate recovery of such cases.

I should like to ask, in reference to the importance of the eye symptoms, if in all cases of brain abscess we should expect to find choked disc? This point came home to me in a case of epidural abscess where the local disease (an acute suppurated otitis media) had all disappeared; the patient had a rise of temperature characteristic of malaria; the plasmodium malariæ was found in the blood; a hypodermic of quinine was given and the symptoms ceased. Localized pain over the upper portion of the antrum was the only symptom that remained and an ocular examination revealed choked disc. A drop or two of pus was found in the antrum and on further exploration a large epidural abscess was found. The patient made a recovery. The only symptom that indicated operative intervention was the choked disc.

Dr. E. L. **Meierhof**: Regarding the presence of choked disc I have had experience with one case of very large cerebellar abscess which developed from a chronic otorrhœa; in this instance there was no choked disc whatever. My opportunity for seeing cases is not great.

I should like to call attention to an important symptom which is an indication for opening the brain and which has not been mentioned here to-night—the slow respiration accompanying cerebellar abscesses. It is a fact that it seems but very few know, although it may be more generally known than I think. Slow respiration without choked disc offers the presumption of the existence of abscess in the cerebellum.

Dr. **James F. McKernon**: I should like to give a brief note of the aphasia persisting in a case which I reported before the Section on Otology last May. This case was operated upon nine days after the aphasia became pronounced. There was a large temporo-sphenoidal abscess which was evacuated, and the patient made an uneventful recovery except for the persistence of the aphasia for three months after the evacuation of the pus. There was a large area of destruction in the temporo-sphenoidal region and also in the occipital lobe, and the large involvement no doubt accounted for the persistence of the aphasia.

Regarding irrigation, I suppose I stand on dangerous ground in the position that I hold. I have had a series of four cases within a little over a year and four recoveries. I believe that when there is nothing to irrigate, do not attempt it; but if there is pus then irrigate. In two of my cases I irrigated eight times with a warm normal saline solution. I do not see why we should not irrigate when there is anything present to be removed. Do not use force enough to displace the brain tissue; allow it to run in and out slowly.

I use packing in these cases, following out the method, as advocated by Macewen in a modified form, of using gauze that has been rolled in equal parts of boric acid and iodoform, packing this in gently, allowing the walls to collapse; each time the dressing is made, placing in less and less gauze, and after the fourth dressing (in one case) there was no pus, and after the eighth dressing (in another case) there was no pus. There were three cases of temporo-sphenoidal abscesses and one of cerebellar abscess. Regarding Dr. Pyle's remarks of cases presenting few or no symptoms, I think this due because the cases are active before they come under our observation. There is no doubt but that typical symptoms are usually present, but we do not have the opportunity of seeing these cases in some instances before the abscesses are well formed.

Regarding eye symptoms, with the exception of one case there were no eye symptoms whatever. Two of the cases were examined by Dr. Charles Stedman Bull and the others by members of the house staff.

Dr. **Edwin W. Pyle**: Körner says that the presence and location of an abscess may be *inferred*, but he gives nothing positive about it. Dean states that it is one of the most difficult things in the world to locate an abscess in the brain, or to diagnose between a meningitis and a brain abscess; when there is pressure, we cannot tell the localized and the generalized symptoms. It seems to me that the border-line symptoms in brain abscess are very misleading. I remember some time ago a young man was brought to the infirmary suffering from earache two days only, but there had been a discharge from the ear for the previous six months. The only symptom was headache, and that was on the other side of the head from the discharging ear. He had a white tongue, fever, and, in other words, had all the symptoms of a bilious state and where we would expect to give calomel to be followed by some saline in the morning, etc. The only symptoms presented were pain referred to the other side of the head from the affected right discharging ear, a white tongue, and some fever. This patient was not operated upon for a day or two, and then pus was found within the inner table; there was a large temporo-sphenoidal abscess in which the finger could be inserted, and about two ounces of pus were evacuated. That man did not have a single symptom which denoted a temporo-sphenoidal abscess; there was no vomiting, or trouble with the eyes, no paralyses of any sort. It seems to me that I have seen more abscesses, comparatively speaking, discovered by accident, than were really diagnosed from symptoms. Now, vomiting is frequently spoken of as a symptom of importance when the cerebellum is affected. I have seen that as a constant symptom in four cases in which the cerebrum only was involved. Dr. Jack does not believe in the necessity of trephining in cases of temporo-sphenoidal abscesses, and we agree with his premises. Almost invariably the cause of infection is otitic in origin; the pathway is through the attic or antral roofs, or posteriorly through the groove. Therefore the antrum is the first point to be opened, and from there we should with the rongeur remove such portions of bone as will thoroughly expose the middle fossa and get good drainage, in the temporo-sphenoidal variety.

The statistics on that point are as follows: of 106 cases operated upon by trephine, 60 died; the trephining was done through the squamous portion of the temporal bone. Of 64 cases operated upon through the antrum, 31 recovered. In 10 cases where a portion of the squamous was removed with the tegmen antri and tympani, 8 recovered. So, in considering these statistics, as given by Hammerschlag, we should enter the fossa from the antrum and have drainage downwards, as advocated by Dr. Jack.

Regarding the subject of headaches: of 195 cases, 103 had headache, but only 28 of them had headache on the affected side; 24 had stupor, with 13 recoveries. Regarding the temperature: out of 170, 46 were normal, 106 elevated, and 18 subnormal. This shows that the elevation of temperature is contrary to what has been the teaching.

Why is there so much irrigation in otology? The general surgeons do not use it, but otologists a great deal. I have knowledge of four cases of brain abscess in which there was a large destruction of brain tissue, of six cases of sinus thrombosis of very extensive type, all accompanying chronic ear disease, and all recovered satisfactorily without irrigation, except to remove surgical detritus at the operation. Irrigation is the outcome of custom, and the testimony as to its advantage is very confusing. Von Bergmann has entirely discarded it at his surgical operations and subsequent dressings.

Dr. EDWARD B. DENCH: Dr. Jack mentioned the fact that he found pus before using the exploratory needle; that is sometimes very satisfactory, but I believe that it is wiser to make a free incision into the brain substance, and I do not believe that there will be much more damage done if all is made clean and if we incise along the line of the fissures rather than across them. I was much interested in Dr. Jack's case. The case of mine that he referred to was reported at the last meeting of the American Otological Society. This secondary breaking down referred to has twice happened in my own cases and the abscess cavity formed was of considerable size. I was obliged to discard gauze drainage and insert the rubber tube and then the patient made a rapid recovery.

So far as irrigation is concerned I think that must depend upon what we are most in the habit of doing and upon the condition of the parts. If there is nothing to irrigate, do not do it; but if there is a sloughing condition, with intracranial pressure, with symptoms of pus absorption, then I say irrigate.

In reference to opening through the squamous plate of the temporal bone I believe it is much easier to make an exploratory opening above the meatus than to take the narrow route through the roof of the antrum and of the middle ear.

In some cases I have adopted the plan of exposing the drum by entering the middle cranial fossa through the squamous plate just above the meatus. By means of the rongeur, the roof of the tympanum and of the mastoid is then removed by enlarging the opening downward and inward. In this way a perfect exposure of the temporo-sphenoidal tube is obtained.

Dr. WILLIAM M. LESZYNSKY: An abscess in the temporo-sphenoidal lobe must be large enough, or so situated as to produce pressure upon certain fibre-tracts, before localizing symptoms are manifested. Hence, a fair-sized accumulation of pus may be present without any discoverable signs. When such an abscess is large enough to produce pressure, we do get positive indications of its existence, such as paresis or paralysis affecting the upper or lower extremity of the face, or a hemiplegia on the opposite side, or various forms of aphasia if the lesion be located in the left side of the brain.

If the abscess has extended anteriorly, there may be a true motor aphasia, and the patient can not speak spontaneously. Even then it is not too late to evacuate the abscess. When the presence of an abscess is merely suspected, exploratory examination should not be undertaken indiscriminately. I am led to make this remark from the fact that I have frequently seen the temporal lobe and also the cerebellum punctured in various directions without any adequate justification, and often the autopsy revealed meningitis but no abscess. It seems to me that such a traumatism to the brain structure is not altogether free from danger, although performed under the strictest asepsis.

In listening to the report on the specimen presented to-night, in which the cerebellum had been unsuccessfully explored, it occurred to me, that in all probability a localized encephalitis or necrosis was produced in the line of the traumatism, thus resulting in the subsequent perforation into the fourth ventricle. If this assumption is correct, it would seem to show that such explorations into the cerebellum are not free from serious danger.

I regret to say, it is now commonly believed unnecessary to seek the counsel of a neurologist in these cases, for the ear-surgeons assume that the neurologist can not throw any additional light upon the subject. It is easy enough to make a diagnosis of abscess of the temporal lobe when it is large enough to produce paralysis and complete aphasia. But if the neurologist could examine such patients earlier, when there might be only slight interference with the speech centres, etc., and also be permitted to study such cases more thoroughly, much more would be accomplished in time in the direction of a correct diagnosis before operation.

Dr. H. KNAPP spoke about the uncertainty of using sensory aphasia, optical or acoustical, in the localization of brain abscess. In his last case of sensory aphasia the abscess had been near the posterior end of the lower temporal convolution.

Dr. SWAIN asked for information about the value of Kernig's symptom in diagnosis between brain abscess and meningitis.

Dr. JACK (closing): The great difficulty in localizing brain abscess has been mentioned. The unscientific but effective plan I have followed is to first explore the temporo-sphenoidal lobe, óver the tegmen tympani, and in case of negative result to explore the posterior fossa.

I had hoped to hear more discussion of the indications for separate opening of the squamous portion of the temporal bone, for a single successful case does not establish the effectiveness of the procedure through the original opening. But the drainage in this case was perfectly free after the insertion of the rubber tube. I was led to choose this method by previous experience with tremendous brain hernias after trephining. The trephine opening may be theoretically necessary for evacuation, but I feel that the present experience would justify me in repeating the method followed in this case. I have found normal or subnormal temperature unusual in this class of cases, on account, I suppose, of the fever-producing character of the infection. I agree with the gentlemen who favor irrigation. It should be continued till the fluid from the cavity comes away clear.

Possibly a slender knife passed in different directions offers a safer and more certain method of locating abscess, but the needle seems to me less liable to injure brain substance.

Dr. WALTON (in closing): An attempt to answer Dr. Knapp in full would reopen the whole subject of aphasia. His observations emphasize the impossibility of disarranging any part of the speech mechanism without impairing its usefulness as a whole. It is certainly difficult in a given case to say just how to account for the varied defects, and to decide just what fibres and centres have been injured. It is all the more difficult, conversely, to allocate the centres from the symptoms of separate cases. The fact that in certain cases of temporo-sphenoidal disease objects seen are not named does not suffice to place the visual speech centre in that region. We must remember that it is not so simple as it seems to decide why an individual cannot name the object seen. If he sees and recognizes a lamp but cannot name it, we should not infer that his visual centre has been interfered with. The auditory word centre in such case may have been destroyed, or the fibres passing to it from the visual centre, for after the individual has seen and recognized the object the fibres must be intact which convey the stimulus to the auditory centre, and that centre must itself be normal in order to reproduce the memory of the sound of its name. A patient may seem free from word deafness because he can interpret simple commands, and yet fail to comprehend such a statement as "The steamer *Deutschland* communicated with wireless telegraphy station on Nantucket Lightship." I should be surprised if complete and systematic examination of a case of temporosphenoidal disease showed absence of symptoms pointing to the auditory word centre or its connections, and presence of symptoms pointing to the visual centre. There are many moot points in the study of aphasia, but most authorities are in accord regarding the seat of the visual, auditory, and kinæsthetic speech centres.

My experience with Kernig's sign in this class of cases is too limited to enable me to draw definite conclusions regarding its diagnostic importance in differentiating between meningitis and abscess of the temporal lobe.

Optic neuritis is less frequent in abscess than in tumor, but if uniformly sought it will probably be found more frequently than is usually believed.

REPORT ON THE PROGRESS OF OTOLOGY IN THE THIRD QUARTER OF THE YEAR 1901.

BY DR. A. HARTMANN.

Translated by Dr. ARNOLD KNAPP.

ANATOMY.

188. **Alexander, E.** A new model of the middle ear for the purposes of instruction. *Arch. f. Ohrenheilk.*, vol. lii., p. 156.

188. The model has been made after specimens from the author by a sculptor, in a 30-fold enlargement. The drum membrane, attic, folds of membrane, the chorda tympani, the ossicles with the muscles, the ligaments, the Eustachian tube, the tympanic cavity, the tegmen and jugular fossa, and pyramidal eminence are shown. The model may be taken apart. It is for sale by Lenoir and Forster, Vienna, Waaggasse 5. DENKER.

PHYSIOLOGY.

189. **Schaefer.** The intracranial transmission of sounds, especially of the deeper sounds, from ear to ear. *Arch. f. Ohrenheilk.*, vol. lii., p. 151.

189. In two tuning-forks of about the same pitch, of which one is held in front of one ear and the other in front of the other ear, the resultant tones are not first perceived in the brain, but each tone is conducted by the auditory nerve of its side, and the diotic vibrations are the result of the excitation of both ears by both sounds. Sound waves conducted to the ear through the air are transmitted intracranially by bone-conduction to the other ear. This form of transmission the author designates as artificial, while the natural transmission is that when the stem of the sounding tuning-fork is placed upon the head. All the experiments were

performed with tones of the middle part of the scale. Tones of fifty or more vibrations conducted to the ear through the air would excite the ear on the diseased side by bone-conduction. As in certain middle-ear affections, the deep tone produced before the diseased ear is neither heard by the diseased ear nor by the healthy ear, and as, according to Bezold, the higher tones when they vibrate in front of the affected ear are perceived by the other ear, the author concludes that bone-conduction necessary for the perception of diotic vibrations is produced almost entirely by the tympanic vibrations in the case of deep-seated tones, while in the higher tones, by direct transmission of the sound wave from the ear to the cranial bones. DENKER.

GENERAL.

a.—REPORTS AND GENERAL COMMUNICATIONS.

190. **Hoelscher.** A short report of the University Ear Clinic in Tuebingen, from April 1, 1900, to March 31, 1901. *Arch. f. Ohrenheilk.*, vol. lii., p. 157.

191. **Stein, V. S.** Contribution from the Otological and Laryngological Clinic of the Royal Friedrich Hospital. *Hospitalstidende*, Nos. 24 and 25, 1901.

190. 1252 patients were treated in the out-patient department. Of these, 114 were subjected to operations of various kinds and degrees of severity; 52 major operations were performed under narcosis on 44 patients. In 42 patients, the cause was acute or chronic middle-ear suppuration; in 2 patients, on account of foreign bodies situated in the external canal. Of acute otitis media, 24 cases were operated upon (in one a large thrombosed transverse sinus was opened); 13 cases of chronic middle-ear suppuration came to operation.

In the chronic cases, the radical operation was performed 16 times, once together with the exposure of an extradural abscess, and in one case simple trephining was performed. In 4 of the chronic middle-ear suppurations intracranial complications were met with, namely: a large brain abscess extending upward, a cerebellar abscess with œdema of the brain, abscess in the left occipital lobe with thrombosis of the sinus and purulent meningitis, cerebellar abscess with œdema of the brain, obliterated left transverse sinus, and stenosed jugular foramen of the left side. All of the complicated cases died. The author draws attention to the difference in symptoms of both cases of cerebellar abscess. In one there was tenderness of the nape of the neck, rigidity of the neck, and in the other, frontal headache and convulsive seizures suggestive of hysteria were present.

DENKER.

191. Among various cases mentioned, there is one of one-sided fibro-adenoma cylindricum with extensive dilatation of the respective half of the nose and deviation of the septum. In the operation the external nose had to be turned up. Also a case of pharyngeal fibroma and a case of abscess in the neighborhood of the lingual tonsil are reported. Among the ear cases, the following are noticeable: A case of bilateral rupture of the drum membrane after a dynamite explosion, the right drum was completely torn loose from the tympanic ring; a case of stenosis of the auditory canal with partial detachment of the external ear; a case of diaphragm formation in the left auditory canal, with chronic middle-ear suppuration, where at the limit between the membranous and bony canal there was a smooth, thin membrane which completely occluded the canal. MOELLER.

b.—GENERAL PATHOLOGY.

192. **Lewin.** The clinical and pathological aspects of genuine diphtheria of the ear. *Arch. f. Ohrenheilk.*, vol. lii., p. 168.

192. As opinions of the genesis and character of aural complications of genuine diphtheria are at variance, the author has systematically examined 60 cases of genuine naso-pharyngeal diphtheria from clinical, pathological, and bacteriological standpoints. The clinical results are as follows: Complication of the ear in genuine diphtheria occurs very frequently in children under five years of age (66.3 %). As a rule this is a very mild middle-ear process without subjective symptoms. The drum membrane shows a slight desquamation, but owing to serous imbibition the details are somewhat lost, there is lack of lustre and cloudiness, and diffuse reddish discoloration. Not a single case of spontaneous perforation occurred. The aural complication in diphtheria begins very early, simultaneous with and even before the appearance of the general symptoms. The author believes that the shortness and width of the tube and the presence of embryonal mucous membrane in the tympanum account for the fact that the ear is so frequently affected in smaller children. The presence of a perforation of the drum is against a specific infection of the

middle ear which would be very much more destructive. The true diphtheritic inflammation of the middle ear complicating genuine diphtheria is comparatively rare; on the other hand, diphtheritic inflammation of the external auditory canal has been frequently observed in the presence of an intact drum membrane. Twenty-two temporal bones of 20 children were examined pathologically and bacteriologically. Twelve of these children had previously been observed clinically. In 18 of these cases the nose and throat were affected. In one case there was a pure cutaneous diphtheria; in another both skin and pharynx were affected. Microscopically the external canal in 9 cases presented accumulations of cerumen and epithelium, and in a case of diphtheritic inflammation of the middle ear in the external canal two ulcers were found covered with pus. The drum membrane in one case presented a large perforation; in all the other cases it was intact. The middle ear was found normal in one case which had come under treatment three weeks after the beginning of the disease. In 2 cases the middle ear was completely free of secretion. In 7 cases the exudation was of a purely mucous or serous character, and in the remaining 11 cases the contents were purulent. The muco-periosteal membrane was found in various degrees of injection and congestion to partial necrosis of the membrane and bone. The cartilaginous Eustachian tube could be seen and examined in 9 cases; in only 3 of these was it inflamed.

Microscopical examination of the secretion revealed nothing characteristic. Diphtheria bacilli were neither found nor could they be grown. In a case of purely cutaneous diphtheria of the genitals, the presence of an acute purulent middle-ear inflammation, with the same picture as was found in the other case but without any sign of infection of the respiratory tract, was very interesting. Therefore, the aural affection in diphtheria cannot be considered as a simple transmission of the morbid process from the pharynx, but is the result of local action of the general infection. DENKER.

c.—METHODS OF EXAMINATION AND TREATMENT.

193. **Ruault and Lepinois.** Oxygenated boric-acid water. *Arch. internat. de laryng., d'otologie et de rhinologie*, vol. xiv., No. 2.

194. **Korff.** The narcosis of Dr. Schneiderlin. *Münch. med. Wochenschr.*, No. 29, 1901.

195. **Ward, Nathan G.** Formalin in the treatment of suppurative otitis media. *American Medicine*, June 15, 1901.

196. **Yearsley, Macleod.** The importance of the early recognition of ear trouble in children. *Pediatrics*, June, 1901.

197. **Dupuy, Homer.** The production of local anæsthesia in the ear. *Laryngoscope*, July, 1901.

198. **Langstaff, L. G.** A new device for syringing the ear. *Med. Rec.*, July 6, 1901.

199. **Amberg, Emil.** Leiter's apparatus for the ear, modified by Amberg. *Jour. Amer. Med. Assoc.*, Aug. 3, 1901.

200. **Milligan, William.** Some practical points in connection with the technique of skin grafting in mastoid operations. *Jour. of Laryng.*, Oct., 1901. Report of Annual Meeting of the British Medical Association.

193. As a pleasant and at the same time most antiseptic gargle, a mixture of a three-per-cent. boric-acid solution in oxygenated water which contains ten volumes of oxygen is recommended. The boric-acid solution must be neutralized. The solution keeps for about two weeks in hermetically sealed glass vessels.

SCHWENDT.

194. This narcosis is new in practice, and consists of a subcutaneous injection of morphine and scopolamine which is repeated at intervals of several hours. The narcosis sets in about one hour after the second or third injection. In certain cases a few drops of chloroform are necessary. The distressing signs before the onset of the narcosis are missing and there is no vomiting. After narcosis there is quiet sleep without any restlessness on the part of the patient. The author recommends this method after trial on eighty patients. SCHEIBE.

195. The following combination of formalin is used by WARD with excellent results: Formalin 5 drops, alcohol 2 drams, aq. q. s. 1 ounce. The suppurating ear is first thoroughly cleansed by syringing, lysol being added to the warm water in the strength of 15 to 20 drops to the half-glassful. After drying, 5 to 10 drops of the warmed formalin solution are dropped in the ear night and morning. The results which may be obtained by this treatment are: Fœtor quickly disappears; early cessation of the discharge; destruction of granulations and the protection against their formation; promotes healing of ulcerated mucous membrane, skin abrasions, and inflammation of the external canal; retards, but does not entirely check, bone necrosis. CLEMENS.

196. The importance of an early recognition of ear diseases in children, with special reference to deafness, is emphasized by YEARSLEY, who thinks that whenever a child is slow in learning to talk, deafness should be suspected. Certain mental defects

may simulate deafness, and these must be excluded; but should a child, otherwise normal, pass its first two years without acquiring a few words, it is probably subject to defective hearing. Pains in the ears of a child may be severe enough to simulate meningitis or only be sufficient to cause restlessness and fretfulness. In any event it is most important to know the condition, and the value of its early recognition cannot be overestimated. CLEMENS.

197. The experience of DUPUY in producing local anæsthesia of the membrana tympani has been most satisfactory with the following combination : Cocaine, 5 to 10 parts ; absolute alcohol, 50 parts; anilin oil, 50 parts. In some cases he found it necessary to increase the cocaine from 15 to 20 parts before complete anæsthesia was produced. The penetration of the solution is both rapid and deep, and in only one case out of fifty so treated were any untoward symptoms of drug poisoning noticed. His method of applying this solution is as follows : 1. As a preliminary measure, the instillation of peroxide of hydrogen is useful to soften and dislodge the loose epithelial tissue found on an inflamed drum, which insures a better chance for the rapid penetration of the solution. 2. In order to get a prompt effect it is essential to fill the external meatus with the solution, and anæsthesia is usually complete in from ten to fifteen minutes.

CLEMENS.

198. This instrument consists of an ordinary cylindrical metal ear speculum of medium size, along the upper wall of which runs a very small channel, which terminates in a small slit-like opening at its inner end, and at the outer end in an expanded portion for the attachment of a connecting tube with the bag. The solution returns through the speculum proper and by means of a tube, if necessary, into a basin supplied for the purpose. The jet of fluid strikes the upper wall of the canal and spreads out over the walls and drum, thus avoiding direct force on the latter. The stream is continuous and steady, and as it is small a large quantity of fluid is not required. CLEMENS.

199. The modified Leiter apparatus is made of flexible material, thus avoiding the lead tubing, and being slightly bent adapts itself to the contour of the head. Different sizes are required for different ears. The short tubes can be easily cleaned. The opening of the inlet is about twice as large in diameter as the opening of the outlet. CLEMENS.

200. To obviate the oozing of blood at the skin grafting part of the mastoid operation, MILLIGAN recommends opening the wound the day before, the skin being simply frozen with Bengue's chloride of ethyl for the purpose. In order to properly adjust the graft, he floats it on warm normal saline solution, which is then rapidly sucked out by means of a pipette passed through the external auditory meatus, thus allowing the graft to sink with it until it is closely applied to the walls. He presses home the gold leaf with glass instead of metal stoppers. The concha flap should also be grafted. To obviate the tendency of the external ear to fall slightly downwards and forwards, he slings it up with tapes soaked in collodion, attached, upon the anterior and posterior surfaces of the auricle, to the top of the head.

ARTHUR CHEATLE.

EXTERNAL EAR.

201. **Wagner, Henry L.** A congenital deformity of both auricles. *Laryngoscope*, June, 1901.

202. **Grossmann.** A case of pulsating cicatrix of the drum membrane. *Berl. klin. Wochenschr.*, No 24, 1901.

201. The patient, five years of age, was born prematurely by two months and shows an interesting congenital deformity of both auricles. It is equally marked on both sides and consists in the absence of the inner part of the upper helix. The missing part of the cartilage can be detected by palpation lying deeply under the skin. The anti-helix is over-developed and runs without forming any crura into an abnormally deep groove. The position of the anti-tragus to the tragus is altered, though the meatus, the tympanum, etc., and the hearing power are normal. The deformity is traced to an arrest of development between the second and third fœtal month. The mental condition shows imperfect development; the boy is just beginning to speak, a condition usually found in similar cases. CLEMENS.

202. A pulsating cicatrix in the right drum membrane led to the discovery of a thyroid tumor, with compression of the right carotid with secondary hypertrophy and dilatation of the left ventricle. The cause of the pulsating phenomenon, according to the author, arose in the capillary hyperæmia and congestion in the tympanic membrane, similar to the changes observed in the fundus oculi. MUELLER.

MIDDLE EAR.

a.—ACUTE MIDDLE-EAR SUPPURATION.

203. **Alderton, Henry A.** A few remarks on a generally unrecognized ear disease (otitis media mucosa). *N. Y. Med. News*, Sept. 21, 1901.

204. **Curtis, H. J.** A case of primary hemorrhagic otitis media. *Lancet*, Aug. 17, 1901.

203. On account of the increased virulence of naso-pharyngeal inflammation due to the great prevalence of grippe, ALDERTON finds that the type of middle-ear inflammation assumes more of a mucous than a serous form in such cases, and its detection is generally very difficult. Unlike *otitis media serosa*, the mucous form appears to occur relatively more frequently in adults. The symptoms are varied. If the exudation is formed rapidly and in considerable quantity, mild vertiginous attacks may occur, but none of the other phenomena associated with Ménière's symptom-complex is observed. The drum membrane may be pushed out a little more than usual; the lustre is absent and the surface is of a dull gray color. The malleal plexus is pronounced, but the hyperæmia is not as brilliant and distinct as that seen in the early stages of the purulent form. There is absolutely no fluid line discernible, nor can its presence be detected by any difference in the appearance of the various quadrants. Change in the position of the patient's head does not cause any improvement in hearing, as is sometimes the case in the serous form. Inflation gives but temporary relief. The treatment par excellence for these cases consists of incision and evacuation of the tympanum, repeated if necessary, and always accompanied by regular politzerization and conscientious treatment of the naso-pharyngeal condition. Should the exudate persist in re-forming, a solution of nitrate of silver, ½ to 1 grain to the ounce of boiled water, acts well when injected into the Eustachian tube and tympanum. No undue reaction has followed this procedure in the writer's experience. CLEMENS.

204. A woman, aged thirty-five years, who had never suffered from any trouble of any sort, began one night at 8 o'clock to suffer with noises described like bells ringing or water boiling, referred to the back of the head on both sides of the middle line at the level of the lambdoid suture. On lying down excruciating pain took the place of the noises, keeping her awake until 2 A.M., when she felt a feeling of something bursting inside the head at a point distinctly located just to the left of the occiput. No pain

or trouble had been experienced in either ear, but the sensation of something having given way in the head was followed at once by a rapid flow of blood from the left ear. The blood was bright red at first and then darker. The bleeding continued from 2 to 11 A.M. becoming gradually paler until only a few drops of pale serum escaped. On examination the blood was found to have come through a perforation in the posterior superior segment. The pain was relieved, but continued for some days. All the symptoms cleared up, and in spite of a most thorough examination of the patient no cause could be found.

ARTHUR CHEATLE.

b.—CHRONIC MIDDLE-EAR SUPPURATION.

205. **Chavasse.** Contribution to the study of cholesteatoma in the ear. *Arch. internat. de laryng, d' otol.*, etc., vol. xiv., No. 3.

206. **Herzfeld.** A case of bilateral necrosis of the labyrinth with bilateral paralysis of the facial and auditory nerves with remarks on lid closure in facial paralysis during sleep. *Berl. klin. Wochenschr.*, No. 35, 1901.

207. **Heine.** A case of hemorrhage from the internal carotid following cholesteatoma. *Berl. klin. Wochenschr.*, No. 11, 1901.

205. The theories of primary and secondary cholesteatomatous formations in the ear are discussed; the author compares these tumors with cholesteatoma of the iris and those observed on the fingers and hands. He considers that the existence and multiplication of epithelium is unproven. In one case, the cholesteatoma had perforated through the tegmen tympani into the cranial cavity and from there externally through the squama. This was associated with acute otitis and pneumonia. In the second case, the process started in the antrum and had destroyed the bony wall of the lateral sinus. In the centre there was a softened and purulent tumor mass with many coli bacilli. Both cholesteatoma were secondary.

The author thinks it is exceptionally necessary to secure a permanent fistula as this does not by any means prevent a relapse. It is preferable to use those operative methods by which the auditory canal is dilated. It most cases the retro-auricular fistula can be closed by plastic procedures. SCHWENDT.

206. The patient, nine years of age, suffered from deafness and facial paralysis simultaneously with pains in both ears and swelling of both mastoid processes, three days after the onset of scarlet fever. There was no vertigo and no headache. Otorrhœa set in a few days later. A radical operation was performed six

or eight weeks later. It is unusual that in so short a period as six weeks the semicircular canals of the left labyrinth were exfoliated, and it is interesting from the few auditory remnants in labyrinthine necrosis that the deafness was so complete. The facial paralysis was also complete. At the same time the author observed, as had already previously been done, that in sleep both eyes were completely closed. He endeavors to explain this by the relaxation of the smooth muscular fibres in the upper and lower lids innervated by the sympathetic, as well as the retraction of the eyeball into the orbit after extinction of the tonus of Tenon's capsule. MUELLER.

207. The cholesteatoma and associated suppuration with destruction of the greater part of the petrous bone led to erosion of the right internal carotid in a patient fifty-six years of age, which gave rise to repeated hemorrhages in the course of a month. The hemorrhages could be arrested by packing, while compression of the common carotid had no result. The color of the blood was dark red and the blood stream showed no pulsatory movement. A diagnosis was therefore made of hemorrhage from the jugular bulb but at autopsy, the patient having succumbed to sepsis, the true condition was made clear. MUELLER.

c.—CEREBRAL COMPLICATIONS.

208. **Stenger.** Otitic brain abscess. *Berl. klin. Wochenschr.*, No. 11, 1901.

209. **Koelscher.** Two cases of latent thrombosis of the sigmoid sinus after middle-ear suppuration. *Münch. med. Wochenschr.*, No. 35, 1901.

210. **Collier, Mayo.** Double optic neuritis, with paralysis of both external recti, following tympanic disease. *Proceedings of the British Laryngological, Rhinological, and Otological Association*, July 12, 1901.

208. A girl thirteen years of age developed distinct symptoms of brain abscess after the performance of the radical operation. Five days later a trephine opening was made over the temporal lobe and at a considerable depth 250 *ccm* of pus were evacuated. After four weeks the amnesic and optic aphasia had disappeared. Distinct symptoms of intracranial pressure, cerebral prolapse, and choked disc were still present but improved after lumbar puncture, which was performed at the end of the third month. All symptoms disappeared at the end of the fifth month.

MUELLER.

209. (1) Acute suppuration, subperiosteal abscess of the

mastoid process, fistula leading from the antrum to the abscess. The sinus was transformed into a thick mass of granulations. At the time of operation there was no fever; afterwards temperature to 39° C. Recovery.

(2) Acute suppuration, subperiosteal abscess behind and above the mastoid process, which communicated through the emissary foramen with the perisinuous abscess. Sinus was converted into a mass of granulations. Recovery. The case was not strictly without symptoms as, according to the history, rigors were present.

SCHEIBE.

210. A female aged eighteen years, after having a polypus removed from the right ear, relieving a cough from which she had suffered for eight months, developed mastoid symptoms together with those mentioned in the title. The complete post-aural operation was performed, and the case did well, but the optic neuritis and paralysis had not improved. Basal meningitis was diagnosed. ARTHUR CHEATLE.

d.—OTHER DISEASES.

211. **Richardson, Chas. W.** Early treatment of mastoiditis. *Laryngoscope*, July, 1901.

212. **Linhart, C. P.** Rapid dilatation of Eustachian tube. *Columbus Med. Journ.*, July, 1901.

213. **Woods, Hiram, Jr.** Acute mastoiditis after subsidence and without recurrence of tympanic inflammation. *Jour. Amer. Med. Assoc.*, Aug. 3, 1901.

214. **Harris, Thomas J.** A year's experience in the treatment of the Eustachian tube by means of the electric bougie." *N. Y. Med. Jour.*, Aug. 3, 1901.

211. Inasmuch as a suppurative otitis is more or less liable to produce a mastoiditis, RICHARDSON thinks that the early treatment of mastoiditis should commence with the purulent invasion of the tympanum or attic cavities. The first and most important indication in the early treatment should be the early and free incision of the tympanic membrane. This procedure is based on the ability of the otologist to discriminate between the acute catarrhal and acute suppurative forms of middle-ear inflammation. It is useless to resort to palliative remedies in hopes that the case will subside without suppuration and perforation. Rest is the second important indication, and the patient should go to bed and remain there until all pain has subsided, tenderness on pressure disappeared, and the temperature normal for several days. Diet should

be liquid. The third indication is the care of the purulent discharge, and for this frequent irrigations with sterile water of a temperature of 110° F. are urged. The fourth indication is to prevent infection of the mastoid or arrest it when it has taken place. The continuous and persistent use of ice by means of the Leiter coil or ice-bag gives the best results, and it should be used as long as there is any evidence of improvement. Should no improvement follow the use of ice after its application for forty-eight hours, operative measures should be undertaken. The continuous use of cold is of greatest value in those cases where no infection of the antrum or cells has taken place, in cases of apparent infection with slight muco-purulent discharge, and in which the temperature is high. CLEMENS.

212. LINHART believes that in cases of middle-ear disease requiring dilatation of the Eustachian tube, or where there is simple tubal obstruction, no method gives quite the same satisfactory results as electrolysis. Two cases are reported as examples. In the first there was stenosis of the right tube only, a sclerotic condition on the left accompanied by distressing tinnitus. Treatment was followed by over 50% gain in hearing distance for the right ear, and a slight gain on the left with cessation of the tinnitus.

In the second case, the bony portion of the tube was so small and narrow as to only allow the smallest bougie passage to the middle ear, yet the result was to open each tube sufficiently to allow a good inflation, and after one year there was an improvement of 100% in the hearing distance. Six applications were made to both tubes.

The removal of tubal obstructions is only one factor in the treatment of catarrhal otitis media. CLEMENS.

213. These three very interesting cases reported by WOODS, in which acute mastoiditis occurred after subsidence and without recurrence of the tympanic inflammation, suggest the question: At what time during the progress of the middle-ear inflammation did the mastoids become infected? In the second case there was no sign of mastoiditis until twelve days after the tympanic disease had disappeared. Of the other two cases one had rigidity of the neck throughout, and the other had rigidity at first with sudden cessation of the otorrhœa and mastoid pain, which disappeared entirely in two days and never returned. The extensive destruction of the cellular structure and inner mastoid wall found in the

first case, and the same condition being present in the second although there were no premonitory symptoms, suggest the probability that the cells were infected in the beginning, and that the inflammation progressed although the tympanic disease subsided. The use of cold was followed with apparent benefit in two cases, but its utility is seriously questioned. It not only masks the symptoms, but tends to increase hemorrhage at the operation, adds to the difficulty in distinguishing healthy from diseased bone, and retards recovery. CLEMENS.

214. The use of the electric bougie in treating stenosis of the Eustachian tube is discussed by HARRIS. His investigations are based on the following questions : (*a*) The value of electrolysis as compared with other methods of treatment in the relief of tinnitus due to middle-ear catarrh. (*b*) Its relative value in improving the hearing. (*c*) How permanently the stricture is relieved? (*d*) What dangers, if any, lie in its use? (*e*) What is the true nature of the process or phenomenon taking place?

The cases were carefully selected and the investigations extended over a period of one year. From the results obtained, Harris feels warranted in drawing the following conclusions : 1. The electric bougie has a place in aural therapy, though a less important one than was at first supposed. 2. It should be used after, and not before, other methods of treatment. 3. It will be most liable to fail if any associated internal ear disease is present. 4. Its results are not always permanent—the stricture may reform—we may hope rather for a diminution than a disappearance of the tinnitus. 5. Its use is not without danger, and a proper knowledge of the anatomy of the parts and of the technique is essential. 6. It is a question whether the process is a true electrolytic one, or if, in many instances, the obstruction is a true fibrous stricture. CLEMENS.

NOSE.

a.—GENERAL PATHOLOGY.

215. **Sturmann.** Double formation of the lower turbinate. *Berl. klin. Wochenschr.*, No. 28, 1901.

216. **Lewy.** Rhinological communications. *Berl. klin. Wochenschr.*, No. 26, 1901.

217. **Schönsboe.** The bacteria found in the normal nasal cavities and the bactericidal action of the nasal secretion. Odense, 1900. Published by Hempel.

215. This very unusual anomaly consisted in the division of the lower turbinate on both sides by a deep furrow which can be regarded as a double formation of the turbinate. The author remarks that the turbinate of most vertebrates was usually double, and that in the human fœtus in the third or fourth month a prolongation of the turbinate bone occurs, which is curved upward, and he regards it as probable that an arrest of development has produced this peculiar formation. MUELLER.

216. The author describes a microscopic specimen of a case of reflex neurosis, originating in polypoid hypertrophies of the nasal mucous membrane, which was arrested after their removal. An unusual amount of nerves was noticeable in the hypertrophied mucous membrane which had been removed. In addition, a specimen of nasal polypi was exhibited, with Charcot-Leyden crystals, and finally a specimen of hyaline deposit after various tumors of the nose. MUELLER.

217. After introducing a sterilized nasal speculum, secretion from the depth of the nose was removed on a platinum needle. Forty cases were examined and the secretion was grown on agar and serum. The growth of up to five colonies on a culture medium was disregarded. In the agar cultures, 23 showed no growth, in 12 there were 1–5 colonies present, in 5 more than 5 colonies. In the serum cultures there was no growth in 20; in 12 there were 1–5 colonies; in 8 more than 5 colonies. The microbes found were the pseudo-diphtheria bacillus, 7; the micrococcus alba liquefaciens, 4; the micrococcus albus, 1; the sarcina lutea, 1; the staphylococcus pyogenes aureus, 1. Four of the cases where bacteria were found were examined again at a later period, and were found sterile. Finally the author examined the reaction of the secretion for bacteria. The nasal secretion was collected from patients who had received an injection of pilocarpine. It was sterilized, and a bouillon growth added of various bacteria. Some of these bacteria were killed and others were increased. MOELLER.

b.—METHODS OF EXAMINATION.

218. **Lichtwitz.** On certain nasal affections which are benefited by treatment with hot air. *Arch. internat. de laryng., d'otol.*, etc., vol. xiv., No. 2.

219. **Viollet.** The treatment of chronic hypertrophic rhinitis by submucous injections of zinc chloride. *Arch. internat. de laryng., d'otol.*, etc., vol. xiv., No. 2.

220. **Kuttner.** On resection of the lower turbinals. *Berl. klin. Wochenschr.*, No. 14, 1901.

221. **Fein.** Resection of the lower turbinate. *Berl. klin. Wochenschr.*, No. 18, 1901.

222. **Mahu.** A simple method of correcting nasal spurs. *Arch. internat. de laryng., d' otol.*, etc., vol. xiv., No. 2, 1901.

218. Certain cases of hay-fever, septic rhinitis, nasal hydrorrhœa, subacute and acute rhinitis, and chronic hypertrophic rhinitis can be treated with benefit according to the methods of Lermoyez and Mahu. Acute otitis media following this method of treatment has never been observed by the author.

SCHWENDT.

219. In diffuse hypertrophies, and also in atrophies where there is no myxomatous degeneration and no raspberry hypertrophies, treatment with submucous injections of 4–5 drops of a 10 % solution of zinc chloride has proved efficacious. The needle is introduced to the bone and then slowly withdrawn during evacuation. The needle must be carefully disinfected, otherwise injection into a vein is possible. This method is supposed to be more rapid in action in certain cases than the methods now used. The author uses a hypodermic syringe with a curved tube 4 *cm* long.

SCHWENDT.

220. The author thinks that resection of the lower turbinals is indicated in many cases where other treatment is not available, and that it gives permanent results if properly performed.

MUELLER.

221. The author recommends nasal scissors for the removal of the posterior end of the turbinate, which he claims can be applied without difficulty by the inexperienced physician.

MUELLER.

222. A triangular piece of membrane and cartilage is resected with the base down, but which includes the most prominent part of the spur. He employs a crutch-shaped knife and a second knife curved on the flat. The operation can be readily performed with these instruments. After excision of this area the septum is straightened by the fingers. Ferripyrin gauze soaked in oxygen water is used as a hæmostatic and as a tampon.

SCHWENDT.

c.—TUMORS.

223. **Jackson, Chevalier.** Primary carcinoma of the naso-pharynx. *Journ. Amer. Med. Assoc.*, Aug. 10, 1901.

224. **Cornell, Stanley S.** A case of angio-sarcoma of the nose. *N. Y. Med. Journ.*, Aug. 24, 1901.

223. JACKSON'S patient, a female cork-worker, complained of constant lancinating pain in her right cheek, above the right eye, deep in the right ear, and in and under the right lower jaw, for three months, prior to which time the pain had been intermittent for a year. There existed right nasal stenosis, odorless, thick and yellow discharge without hemorrhage, infiltration of cervical, parotid, and submaxillary glands, anchylosis of the jaw, and an asymmetrical face, the right cheek being somewhat swollen. Temperature, 97.6°; a low grade of optic neuritis: O.D. 15/30, O.S. 15/70; infiltration of the right pillars and a downward bulging of the right side of the velum. Posterior rhinoscopy revealed a cauliflower-like mass hiding the Eustachian prominence, except the lower border of the orifice, which was in line with the vomer, owing to considerable swelling. The mass was in contact with large masses of adenoid tissue, and was found to spring from the right lateral wall between the Eustachian orifice and the choanal margin. It was a glandular-celled carcinoma. Jackson has carefully tabulated fourteen published cases and appended a bibliography. M. TOEPLITZ.

224. CORNELL'S patient, a woman sixty-four years old, developed, after an attack of influenza, for two years marked stenosis of the nostril without discharge, except blood, after picking. The left nasal bone and nasal process of the adjacent maxilla were shoved apart. The left nasal cavity was filled by a bluish-gray bulbous growth, which was intensely vascular and globular, and bled profusely upon being touched. Slightly movable, it was partly removed with the snare, and then seen to be attached to the anterior end of the middle turbinate, which was also removed with the remaining portion. Recovery took place. The tumor was an angio-sarcoma. M. TOEPLITZ.

d.—ACCESSORY SINUSES.

225. **Braunschweig.** Combined empyema of the accessory sinuses. *Münch. med. Wochenschr.*, No. 29, 1901.

226. **Casselberry, W. E.** Serous disease of the maxillary antrum, with a report of two cases. *The Laryngoscope*, July, 1901.

227. **Ingals, E. Fletcher.** Empyema of the frontal sinus. *Journ. Amer. Med. Assoc.*, July 27, 1901.

228. **Pooley, Thomas R.** Empyema of the frontal and ethmoidal sinuses and orbital abscess. *Phila. Med. Journ.*, July 6, 1891.

229. **Mayer, Emil.** Empyema of the antrum of Highmore in young infants. *Med. Rec.*, Aug. 10, 1901.

230. **Payne, Redmond W.** Anomalies of the frontal sinus and their bearing upon chronic suppurative sinusitis. *Journ. Amer. Med. Assoc.*, July 27, 1901.

225. This was a case of chronic empyema of the frontal and ethmoid sinuses, with swelling of the external parts and exophthalmos. The Kuhnt operation with resection of the ethmoid cells was practised. SCHEIBE.

226. After an exhaustive review of the views of other authors on polyps, cysts, hydrops, and serous collections of the maxillary antrum, CASSELBERRY relates two cases of his own, one of acute sinusitis with retained muco-serous secretion, and the other of chronic serous disease. The diagnosis is based upon aspiration, suggested by nasal polypus, degeneration of the middle turbinated body, and ill-defined browache or sense of fulness in the cheek; transillumination being indecisive.

M. TOEPLITZ.

227. After an exhaustive discussion, particularly of the anatomy and pathology, symptomatology and treatment of empyema of the frontal sinus, INGALS cites four cases of his own:

Case I. showed a swelling of the left turbinate with purulent secretion from the middle meatus, which ceased upon nasal irrigations.

Case II. had supraorbital pain every forenoon, and symptoms indicative of empyema of Highmore's antrum. A portion of the middle turbinate was cut away, but the patient finally recovered without opening of the sinus.

Case III. was a suppurative ethmoiditis, combined with suppuration of the frontal sinus, with an additional empyema of the right Highmore's antrum. The patient was under observation for ten years. The antrum trouble healed, the polypi and the middle turbinate were removed, and the empyema of the frontal sinus was finally also brought to a standstill through injections of from 5 to 7 % solutions of protargol, which were decreased to 3 %.

Case IV. had a swelling in the supraorbital region extending to the root of the nose, and polypi in the right side of the nose. The frontal sinus was opened from without and drained through the nose and the outer opening. The after-treatment, which had lasted over a year, had not led to entire closure and cessation of discharge. M. TOEPLITZ.

228. A young man of nineteen, ever since he had scarlet fever six or seven years ago, had his right eye affected, which was at times painful and watery; but a year later the lids were swollen a little. When first seen by POOLEY, he had most intense pain in and around the right eye and on the entire side of the head. The eyelids were swollen, red, shiny, and sensitive with chemosis at the upper-inner angle and slight ptosis. In the upper inner angle above the tendon was a minute fistulous opening without discharge. Temperature 104°. Pulse 120. An acute exacerbation had set in upon a chronic sinusitis of both the frontal and ethmoidal sinuses extending into the orbital cavity. The incision was made close to the bone, beginning at the outer third of the orbital ridge to the internal canthus, thence downwards and inwards along the nose to the lower border of the orbit. The fistula led through the anterior wall of the frontal sinus which was filled with polypoid granulations, the ethmoid cells were infiltrated with pus, and out of the orbital cavity escaped a considerable quantity. The cavities were freed of their contents and a drainage tube was introduced from the anterior ethmoidal cells through the infundibulum into the nose. The nasal polypi disappeared spontaneously. The patient made an excellent recovery.

M. TOEPLITZ.

229. A girl, two and a half years old, presented an eversion of the right lower lid, a fistulous opening in the right cheek from which pus exuded, and a most penetrating odor from the right side of the nose, following an attack of scarlet fever complicated by pneumonia six weeks before. Two weeks afterward she was seized with mild " diphtheria " in the throat, and a severe one in the nose, wherein no Klebs-Loeffler bacilli were found. An abscess formed on the cheek; it was incised; a fistula remained, which closed after thorough removal of necrosed bone. Streptococci and staphylococci were found in the pus. MAYER quotes six similar cases observed by others; he agrees with Lennox Browne, that empyema occurs in young infants in the antrum maxillare, which is well defined at birth but undergoes little change until the second dentition, against Avellis who considers it a medullary inflammation. The last part of the paper is taken up by the etiology of empyema of Highmore's antrum. M. TOEPLEITZ.

230. The anomalies of the frontal sinus are shown in specimens with two unequal and three sinuses respectively, a very deep cavity, and one with three septa. Intranasal operations only

provide free drainage. A positive diagnosis can be made only by an exploratory opening. PAYNE makes successive openings to expose every part of the sinus and leaves two external openings for free irrigation. M. TOEPLITZ.

e.—OTHER DISEASES.

231. **Lermoyez.** Nasal neuralgia from galvano-caustic cicatrices of the inferior turbinate. *Arch. internat. de laryng.*, etc., vol. xiv., No. 4.

232. **Johnston, Hugh A.** A case of purpura with gangrene (dry) of the nose. *Amer. Medicine*, Sept. 14, 1901.

233. **Goodale, J. L.** Acute œdema of the nasal septum. *Journ. Amer. Med. Assoc.*, July 20, 1901.

234. **Cobb, Carolus M.** Can nasal catarrh and catarrhal deafness be cured? *Med. Rec.*, Sept. 7, 1901.

231. After removing nasal polypi and galvano-caustic treatment of the lower turbinate, obstinate infraorbital neuralgia resulted. With a probe the hyperæsthetic area could be determined. After removal of the turbinate LERMOYEZ found a simple neuroma imbedded in the scar tissue. The neuralgia completely ceased after this operation. SCHWENDT.

232. The patient, a woman aged thirty years, after a miscarriage, was suddenly seized, while sewing, with a hemorrhage, mainly into the subcutaneous tissue of the nose and adjoining cheeks, limited by the eyes above and the mouth below. After three days there was slight absorption from the cheeks, which were dark red, while the nose was an intense black (dry gangrene) with an offensive discharge from the nostrils. There were also spots of a bright-red color, which were not removable by pressure. Temperature 101°. Pulse 130. The patient died two days later from pulmonary involvement. M. TOEPLITZ.

233. GOODALE relates two cases of œdema of the nasal septum: the first, on the left side, in front of the posterior extremity, which during a second attack grew enormously, so as to fill the naso-pharynx completely, was of specific and ethmoidal origin; the second, on the middle and upper portion of the right side, blocking the passage, was attached to a bony ridge of the ethmoidal plate. M. TOEPLITZ.

234. Inflammation of the mucous membrane of the middle ear is a part of a general inflammation of the naso-pharynx, which is caused by a collection of fluid from the accessory sinuses, the enlargement of lymphoid tissue being secondary. The primary causes are infectious diseases, purulent rhinitis of children, and

possibly diseased teeth; not obstructed nasal respiration. Empyema of the accessory sinuses is rarely recognized, but nevertheless frequently present. Ten fully reported cases illustrate these views. M. TOEPLITZ.

PHARYNX.

235. **Veillard.** Arterial hemorrhage in the course of peritonsillar abscess. *Arch. internat. de laryng.*, etc., vol. xiv., No. 3.

236. **Jundell and Svensson.** A case of chronic progressive abscess caused by the diplococcus pneumonia secondary to angina. *Nordiskt medicinskt Arkiv*, 1901, No. 5.

237. **Gruenwald.** Origin and treatment of abscess in the pharynx. *Münch. med. Wochenschr.*, No. 30, 1901.

238. **Stinleth.** The malignant tumors of the tonsil. *Münch. med. Wochenschr.*, No. 35, 1901.

239. **Pearson, S. Vere.** The acute retropharyngeal abscess of infants. *Lancet*, Oct. 26, 1901.

240. **Munn, Wm. P.** Acute follicular tonsillitis complicating the course of true diphtheria. *Amer. Medicine*, Sept. 7, 1901.

241. **Cary, Chas.** and **Lyon, J. P.** Pseudo-membranous inflammation of the mucous membranes caused by the pneumococcus. *Amer. Jour. Med. Science*, Sept., 1901.

242. **Lack, H. Lambert.** On the removal of tonsils in adults. *Journ. of Laryngology*, Oct., 1901. Report of annual meeting of the British Medical Association.

243. **Wingrave, Wyatt.** Tonsillotomy rash. *Journ. of Laryngology*, Oct., 1901.

244. **Key, B. P.** A large abscess of the pharynx caused by probing for a plate of false teeth that supposedly lodged in the œsophagus. *Amer. Medicine*, Aug. 17, 1901.

245. **Casselberry, W. E.** Types of membranous pharyngitis. *Jour. Amer. Med. Assoc.*, July 20, 1901.

246. **Richards, Geo. L.** An unusual anomaly of the faucial tonsil. *Jour. Amer. Med. Assoc.*, July 27, 1901.

235. In a young man twenty-six years of age, in the course of phlegmonous angina a severe arterial hemorrhage occurred without surgical intervention. Complete rest, ice, and ergot prevented a relapse. The author thinks the outcome of this case was unusual and that in most cases one should not wait too long to decide upon ligature of the common carotid. SCHWENDT.

236. A healthy woman, twenty-nine years of age, was taken ill with severe pseudo-membranous angina with marked, glassy œdema of the tonsils and uvula and external œdema of the neck. As the œdema extended the fever continued. The affection in the throat disappeared in two months without having led to abscess

formation, but a simultaneous affection of the lower part of the sternum then began which gave rise to a subcutaneous abscess after a month. There were no diphtheria bacilli found. A little serous fluid was obtained from the œdematous uvula, but remained sterile on agar and serum. In the second abscess, the evacuated pus showed the presence of the diplococcus pneumoniæ. According to the authors, the pneumococci produced the entire disease and after the first period they became attenuated and thus produced this long-drawn-out and comparatively mild inflammation.
MOELLER.

237. The author divides pharyngeal abscesses into supratonsillar, peritonsillar, retronasal, and acute and chronic tonsillar abscesses. The supratonsillar abscess is the most frequent. He does not believe that acute infectious abscess is a new disease-entity. The sudden onset of dyspnœa and cardiac weakness is explained by the severity of the toxæmia. SCHEIBE.

238. A case of round-celled sarcoma of the tonsil healed by operation is reported and the clinical picture of malignant tumor of the tonsil is perfectly and exhaustively portrayed. The sarcoma was as large as a hen's egg and had led to glandular involvement. It recurred after three weeks and was again operated upon. There has been no further relapse for two years. SCHEIBE.

239. In connection with this subject, PEARSON draws attention to the fact that the abscess is frequently preceded or accompanied by a purulent nasal discharge. Cases are given.
ARTHUR CHEATLE.

240. A girl, aged ten years, presented on the right tonsil a membrane containing Klebs-Loeffler bacilli, which was promptly relieved by antitoxin. Four days later, the follicles of the left tonsil were separately filled with secretions presenting a typical follicular tonsillitis. M. TOEPLITZ.

241. During the course of an attack of acute lobar pneumonia in a boy of eleven years, a profuse pseudomembranous exudation upon nearly all the mucous surfaces of the body, first of the tonsils, then the lips, tongue, mouth, palate, throat, and nose, which was transferred to the eyes, penis, and anus, was caused by the pneumococcus, the fibrinous processes also involving the pleura and the gastro-intestinal tract. The case terminated, after a severe and protracted course, by gradual lysis, in complete recovery. M. TOEPLITZ.

242. LACK estimates that, in cases of adults of twenty years and upwards with large fibrous pear-shaped tonsils, severe hemorrhage will occur in one out of every three or four cases if cutting instruments are used; he advises in these cases removal with a cold snare. ARTHUR CHEATLE.

243. WINGRAVE describes cases of an eruption which occasionally occurs on the neck, chest, abdomen, extending frequently to the face and extremities, on the first day to the sixth day after the removal of tonsils and adenoids. The eruption is either papular, roseolous, or erythematous in type and is of from two to five days' duration. After reaching its maximum intensity it rapidly disappears without desquamation, but is sometimes associated with intense itching. ARTHUR CHEATLE.

244. A man, æt. fifty-five, dislodged a plate with incisor teeth for the upper jaw, which slipped from the soft palate into the right vault of the pharynx. Attempts at extraction failed, but it was spontaneously thrown out when he recovered from the narcosis. Ten days later, an abscess containing four ounces of offensive pus opened in the right vault from a large fluctuating tumor. M. TOEPLITZ.

245. CASSELBERRY'S two cases are distinguished from true diphtheria and confluent follicular tonsillitis by the predominance of the staphylococcus and streptococcus respectively, and by the mild course of the first and the severer and longer one with systemic depression of the second case. Other infections with the pneumococcus, fusiform bacillus, etc., and fungi are also mentioned. M. TOEPLITZ.

246. In cutting through the right tonsil of a woman, sixty years old, with a tonsillotome, a hard bony mass was encountered, which, when removed with a bone-cutting forceps, proved to be a portion of the styloid process. M. TOEPLITZ.

BOOK NOTICES.

I. **Therapeutique des maladies de l'oreille.** Par M. Lermoyez, médicin des hôpitaux, et M. Boulay, ancien interne des hôpitaux, de Paris. Octave Doin, publisher, 8 Place de l'Odéon, Paris, 1901. Price, frs. 8 ($1.60).

Two volumes, small octavo, in flexible binding, very handy, thin paper but good and easily legible print, part of the Bibliothèque de thérapeutique médico-chirurgicale, edited by Dujardin-Beaumetz and Terrillon, complete in 40 volumes, frs. 4 each.

Volume I. has 71, volume II. 45 figures in the text, to illustrate the instruments and the technique of the operations. The style is exceedingly easy and clear, with careful classifications, divisions, and subdivisions to aid the memory. The contents are more extended than the title announces, namely besides the therapeutics also a good deal of topographical anatomy, physiology, and pathology, and the methods of examination in full detail, all that is contributable and necessary for the intelligent and rational treatment of each variety of disease. The descriptions of the manipulations and operations could not be more explicit, entering into the minutest details, which are mostly taught only in practical operative courses. The whole work is fully up to date; as to literature the French is naturally most utilized, the German quite extensively, the English less.

Volume I. (434 pages) treats first of the technique and therapeutics in general (191 pages). After some seasonable remarks on the importance of otology, he begins with the examination of the outer ear and the drum membrane (32 pp.). We may mention that after full appreciation of the conditions of the ear-canal and drumhead by the various speculums in use, he says that the pneumatic speculum (Siegle's) is indispensable; deafness may, for instance, have no other cause than the immobility of the hammer, and this can be recognized only with the pneumatic speculum.

The aëration of the drum—Valsalva, Politzer, catheter—are fully described; especially the catheterization (invented by Deleau) is dwelt upon in its indications, different methods, and dangers. The necessity of using the auscultation tube, and the tubular and pneumatic speculums during the inflation, is pointed out.

The cleansing of the ear is dealt with under the heads of wet and dry cleaning. The latter is only briefly described as by insufflation (only to use powders) or by the cotton-tipped probe. The wet cleansing, chiefly by syringing, is minutely described, as to the straightening of the ear-canal in adults (up and backward drawing of the auricle) and young children (straight back, even slightly down), the same as in inspection. He lays great stress on perfect sterilization of the tampons, the syringes, and the injected liquid; we may mention here that the attention to asepticism is dwelt upon throughout the whole book. Follow now: instillation of liquids into the drum through the E. tube or the ext. ear-canal, bougirage of the tube, and massage of the middle ear. The author (like the reviewer) reserves his judgment as to the degree of utility of the many procedures used in that line to improve the acuteness of hearing and diminish tinnitus. The direct massage by elastic probes (Lucae), and the outward and inward motion of the drum membrane through rarefaction and condensation of the air in the ext. ear-canal by means of the stiff tubes and the mouth or instruments (Delstanche's hand-masseur, the modern electro-motors) are described and critically discussed.

A chapter of 12 pages on the physiological or therapeutic action of electricity of the ear, describes the action of this agent on the ear in its threefold modes (galvanism, faradism, franklinism) and its results which are variable and in general mediocre and very inconstant. The last chapter on general therapeutics is a good and full description of the instruments to improve the acuteness of hearing: tubes, trumpets, shells, audiphones, and artificial drumheads. The special part treats of the different diseases of the ear. A short exposition of their differential diagnosis, course, and termination precedes the treatment, which is given in minute detail, as to execution, accidents, and after-treatment of operations. The indications are carefully specified according to the nature of disease, its varieties, its duration, the constitution of the patient, his surroundings, etc. We shall follow the author, making here and there some remarks suggested by the text.

Othematoma.—Nothing new.

Plugs of cerumen.—Excellent exposition of this common disease. "The removal of cerumen is the triumph of otology," says the author, which can be paralleled by a dictum the reviewer heard another aurist say: "Syringing is the most important operation in ear-surgery." Both propositions may be sustained if we ask what operation does the greatest good to the greatest number. The reviewer could not say that he found anything new in Lermoyez's article of twelve pages on cerumen, but he should say that he never read a better description of the trouble, with all its trifles that seem unimportant yet must not be ignored.

The removal of foreign bodies from the ear is described on twenty-six pages, from the simple syringing to Stacke's operation, when the foreign body has penetrated into the drum or beyond it into the mastoid antrum or into the labyrinth, or by opening the cranial cavity in case cerebral complications (abscess, meningitis, sinus thrombosis) are manifest. If the foreign body has not penetrated farther than the drum and its walls, the incision around the meatus should be close to the auricle, through the skin only, as the periosteum is not involved. The upper, posterior, and lower walls should be detached as far as possible, pressed against the anterior wall, or drawn out of the way by a small strip of sterilized gauze. Stenosis of the canal is prevented by tamponing, best after the slitting of the posterior membranous wall.

The following subjects, furunculosis of the ear canal, otitis ext. diffusa, otomycosis, eczema of the ear, narrowing, and exostosis, are described on fifty-two pages with the same care as the previous subjects.

Then follows an eloquent introduction on the importance and the treatment of acute middle-ear inflammation, its neglect by patients and physicians being the cause of the vast majority of the subsequent grave diseases. Most of them begin in childhood, are recovered from if left alone, but not without permanent damage to the organ of hearing and the whole system, which might have been prevented by proper care and treatment in the first attack. He distinguishes three varieties—catarrhal, serous, and purulent acute otitis media. The first two are well described; the execution of paracentesis of the drum in the serous form is recommended. In the purulent form, the reviewer thinks, there is too much miscellaneous treatment advised. This being a grave disease, the sufferers, young and old, should be kept in bed from the beginning, even before the drumhead is burst spontaneously or artificially. The diet and care should be that of a seriously sick person, with no compromise. Any kind of inflation should be avoided; the tympanic membrane, when sagging, should be incised, not by a timid linear or even crucial opening (if this form be possible), but best by forming a tongue-like flap, beginning a little below the umbo, going along the posterior border of the handle to the level of the aditus ad antrum, then horizontally backward about 3 or 4 *mm*, and finally downward along the posterior wall of the drum, and, further, down to the bone along the adjacent part of the posterior meatal wall, *i. e.* an interior Wilde's incision. The upper part of the tongue-like flap will contract and leave a quadrangular opening over and below the aditus ad antrum, where in most cases the pathway of the pus is situated. This opening, in the experience of the reviewer, has less tendency to close than any other, and secures easy drainage both from the tympanic and mastoid cavities. The cleansing, in the reviewer's judgment, is best done with a cotton-holder, yet in some cases of copious discharge syringing cannot be discarded, but it should never be forcible. There is very little other topical treatment required. The after-treatment has been well laid down by the author.

Acute mastoiditis is an osteitis of the walls of the air cavities of the mastoid process, not the simple presence of pus which, produced in the middle ear, may be stowed up in the mastoid cells (simple mastoid empyema) without affecting the walls of these cells. In the latter there is no need for a surgical intervention on the mastoid. Primary mastoiditis from influenza, pneumonia, etc. may occur but it is exceptional. The cases considered and described as primary mastoiditis are mostly such as originated in the naso-pharynx as usual and affected the drum cavity lightly, but developed freely in the mastoid process; one could say: "The infection from the naso-pharynx extending through the Eustachian tube licks the drum and bites the mastoid." The mere fact of striking pus does not prove that opening of the mastoid was necessary. The symptoms of mastoiditis are very well described. Speaking of the seat of the pain he says: Located in the tip, it signifies nothing, for it is present in every acute otitis.

Persistent fetor indicates that behind the acute symptoms an old lesion conceals itself, usually a cholesteatoma ; in this case trephining would surely fall short ; the total cleaning-out of the petro-mastoid must be done. Lermoyez advocates strongly not to content one's self with a partial or insufficient opening, " but in every case to open the antrum and all secondary cells that are diseased, an operation more laborious, slower in healing, less brilliant, but absolutely sure,—the true operation of the aurist." The description of trephining (*i. e.*, chiselling) is very minute in all its details. Among the dangers, he says, " that exposing the dura is of no consequence, whereas to pierce it is mostly fatal." He makes a quadrangular opening into the bone, each side 1 *cm* long, with a plain, short chisel held at right angles to the surface, the anterior border ½ *cm* behind the posterior meatal wall. Why the author and others prefer a quadrangular to a round opening the reviewer does not know. In children all the dimensions are reduced. The author has faith in the *curative* effect of well-executed electrical treatment on post-operative facial paralysis, faith which the reviewer lacks. The after-treatment of the wound is very judiciously described.

The second volume begins with *general principles of treatment*, to cleanse the field and localize the suppurating part. This is followed by special therapeutic indications, granulations, etc., with local caustics : pearls of nitrate of silver and chromic acid, trichloracetic acid, with a cotton-tipped probe. How to prepare and apply these chemical caustics and galvano-cautery is well described.

The treatment of *diffuse infiltrations* is by nitrate of silver, absolute alcohol, and perchloride of iron.

Polypi, always the consequence of an old, neglected suppuration, should be *removed*, because they stand in the way of properly treating the primary affection. This is done by the snare, curette, simple or double (Mignon's), in case they are on the ossicles. Accidents by these operations: tearing off the ossicles, laceration of the tympanic walls, hemorrhage, consecutive inflammation. Relapses frequent.

Cholesteatoma is described in its nature, cause, pathology, and treatment, on ten pages.

Osteitis, of the ossicles and the drum-walls, canal-wall of the facial nerve, and the antrum, as to the recognition of its existence, seat, and nature, is very well though concisely described, whereas the operative treatment—removal of the ossicles and its results—is presented in great detail. If the caries is limited to the ossicles, the removal of the latter gives a sure and rapid recovery in most cases, also with some improvement of hearing. The operation for parietal drum-caries frequently gives only a temporary relief, which has to be supplemented by the *cleaning-out* of the *petromastoid*, the *radical operation* of the Germans. An historical sketch of the development of this operation through Zaufal, Stacke, and Schwartze precedes a very instructive and comprehensive description of this remarkable achievement in aural surgery. In the last act of this operation, "autoplasty of the soft parts," the author describes minutely Stacke's method, and briefly the methods of Körner, Panse, and Kretschmann. The accidents during the operation refer to the wounding of the dura mater, the lateral sinus, the facial nerve, and the external semicircular canal. Great care is taken in the description of the long and tedious after-treatment. The discussion of the prognosis, the results, and the relapses terminates this chapter, which is so full of difficulties. The subsequent chapters are: Chronic exudative and dry middle-ear inflammation, with their adhesive processes and their manifold ways of treatment; in the dry variety generally so unsatisfactory; in the sclerotic condition its principal symptom, deafness, is always incurable, and its distressing symptom, tinnitus, can at best be only temporarily relieved.

The affections of the inner ear occupy thirty pages: syphilis, acquired and hereditary, seventeen; tuberculosis and neoplasms, thirteen; the traumatic lesions, twenty. Thirty pages are devoted to deaf-mutism, and the education of deaf-mutes. The hygiene of the ear from earliest childhood through the different ages, the influence of climate, the dwelling and surroundings of the patient, and of the different trades are duly considered. The book concludes with "Instructions Concerning the Care of the Ears" in thirteen condensed paragraphs.

Lermoyez and Boulay's text-book is admirably suited to meet the requirements of the student and aural practitioner.

H. K.

II. **The Practical Medicine Series of Year-Books.** Vol. III. *The Eye, Ear, Nose, and Throat.* Dec., 1901. Chicago, 40 Dearborn St.

The second part, **The Ear**, by Dr. ALBERT H. ANDREWS. Pp. 133 to 221. Small octavo. Unglazed paper, easily legible print.

This is an instructive and convenient book for specialists. It gives a comprehensive, rather elementary, introduction to each chapter—for instance, p. 144: "THE MIDDLE EAR. **Acute Otitis Media.** There are two separate and distinct forms of ac. otit. med.—catarrhal and purulent,"—then follow the symptoms as they are found in every text-book. The same for the Ac. Cat. Ot. Med. and the Ac. Suppurat. Ot. Med. After this there are abstracts of papers which appeared in the year 1901—for instance, Edw. W. Pyle: The importance of a more accurate knowledge of the rudiments of otology by the general practitioner; The infection reaches the ear through the Eust. tube in 99 % of the cases (W. C. Phillips); The value of early paracentesis (J. E. Brown); Acute ot. med. complicating influenza (J. F. McCaw), etc., thus furnishing a comprehensive review of the different departments at the hand of the newest literature. Though much general knowledge is reiterated in this way, it certainly is pleasant to peruse the handling of the subjects in such a convenient form. Some of the chapters are very instructive—for instance, that on Otitic Brain Abscess. Introductory, followed by abstracts of Extradural Abscess and Intradural Abscess. Operation by C. A. Ballance (*Lancet*, May 25, 1901), quite in detail (occupying 5 pages). Then follows Preysing's "Three cases of death from Brain Abscess" (taken from the April No., 1901, of the ARCH. OF OTOL.), with a reproduction of two photographic plates. The Healing of Brain Abscesses, by Passow (ARCH. OF OTOL., Feb., 1901). In the same manner sinus thrombosis and internal ear are treated.

The third part, **Nose and Throat** (pp. 225–328), is by T. MELVILLE HARDIE. The rhinological part is well presented, the laryngological rather briefly.

The book is handy, very readable, and will be enjoyed by many readers as an interesting and instructive repetition of the more serious periodicals (repetitio est mater studiorum). It will be particularly attractive to the large number of physicians, both in this country and in England, who go to the larger medical centres for post-graduate instruction. Though the French and German literatures are scarcely mentioned, the early appearance and the light vein of the little book are only another example of the prompt energy of the people in the metropolis of the Middle West. H. K.

MISCELLANEOUS NOTES.

PUBLIC MEETINGS.

The seventh annual meeting of the Western Ophthalmologic and Oto-Laryngologic Association will take place in Chicago, April 10th, 11th, and 12th. Pres., Dr. C. R. Holmes, Cincinnati; Secy., Dr. W. L. Ballenger, Chicago.

On account of the date of the next International Medical Congress (at Madrid) in April, 1903, the **International Otological Congress** at Bordeaux (France) has been postponed to August or September, 1904, the exact date to be determined later.

The **Otological Society of the United Kingdom** will meet at Chandos St. 11, Cavendish Sq., at 4.30 P.M., May 5th, and Dec. 1st (annual dinner).

APPOINTMENTS AND DISTINCTIONS.

Prof. **Adam Politzer** of Vienna has been awarded the highest honorary title at any Austrian university, viz. Hofrath (aulic councillor).

Dr. **Sebileau,** professeur agrégé à la Faculté de Médecine chirurgien des Hôpitaux de Paris, has been appointed chief of the oto-rhino-laryngological service of the Hôpital Lariboisière, replacing the late Dr. Gouguenheim.

Dr. **Schiffers** has been appointed professor in ordinary of oto-laryngology at the University of Liège, Belgium.

OBITUARY.

Chas. H. Burnett, of Philadelphia, died Jan. 30, 1902, in his sixty-second year. He took his academic degree at Yale College in 1864, and his medical degree at the University of Pennsylvania in 1866, and pursued his studies in Europe. In 1877 he published a valuable text-book on *The Ear, its Anatomy, Physiology, and Diseases,* of which a second edition, revised and rewritten, appeared in 1884 (large octavo, 583 pp.). He was the chief editor of an *American Text-book of Ear Surgery,* in two volumes, and the author of many valuable contributions to Otology published in the *Transactions of the Am. Otological Society,* in which he was an active and popular member. Though the Reviewer has not been able to share his enthusiastic opinion on the value of intratympanic operations in chronic non-suppurative otitis media, nor his utter condemnation of the value of the removal of adenoid vegetations in the pharynx, he esteemed and liked Burnett as an honest, intelligent, and faithful worker in otology, whose name will be honorably connected with the development of ear surgery in this country. H. K.

Edwin W. Pyle, Jersey City, N. J., died Feb. 7, 1902, in the fifty-third year of his age. He was graduated at the University of Pennsylvania in 1873; was at first a general practitioner, but during the last years of his life his chief occupation was ear surgery, favoring conservative methods, though as assistant surgeon under Fred. Whiting at the New York Eye and Ear Infirmary he had abundant opportunity to watch and do serious and extensive ear operations, of which his paper, "A Correlation of One Hundred Successive Mastoid Operations," published in the last volume (xxx., p. 214) of these ARCHIVES, gives testimony.
H. K.

Emilio de Rossi, professor in ordinary of otology and rhinolaryngology at the University of Rome, Italy, died November 12, 1901, in Rome, aged fifty-seven years. As early as his 21st year he devoted himself to the study of otology; in his 23d year he published a popular text-book of otology. In 1870 he followed a call to the University of Rome, to teach otology; in 1881 he was appointed extraordinary, and in 1891 ordinary, professor. He was a man of great talent, unusual working power, and didactive ability, of refined manners, genuine kindness, and attractive personality. He was co-editor of the *Archivio Italiano di Otologia, Rhinologia e Laringologia.* Besides his text-book he published numerous valuable papers. He occupied an elevated position among his compatriots. H. K.

Dr. **Achille Gouguenheim** died in Paris in his sixty-third year. He was attending surgeon of the oto-laryngological department of the Hôpital Lariboisière, where he had a very large service, especially in nose and larynx diseases. With Lermoyez he was editor of the valuable *Annales des maladies de l'oreille, du larynx et du pharynx.* He published many valuable papers. His chief publication was his large *Atlas de Laryngologie et de Rhinologie,* grand-folio with 37 plates in black and colors, containing 246 figures, besides 47 in the text. The descriptions are in French and English. Paris, G. Masson, 1894. It has been reviewed in these ARCHIVES (vol. xxiii., 1894, pp. 241–244).

EDITORIAL NOTICE.

The **Archives of Otology** is a bi-monthly journal, published in annual volumes of about six hundred pages each, extensively illustrated with cuts in the text, half-tone text plates, and lithographic plates, many in colors. About three-quarters of the space is devoted to original papers, and the remaining quarter to a systematic report on the progress of otology, and to reports of societies, book reviews, and miscellaneous notes. The papers and reports are original, and only accepted with the understanding that they are to be published in this journal exclusively. The original papers in the English edition appear in the German (*Zeitschrift für Ohrenheilkunde*) either in full or in more or less abridged translations, and *vice versa*. Any subscriber who wishes to refer to the original text of a translated or abridged paper may, by applying to the editor, obtain a reprint which he is expected to return after perusal.

The subscription price of the ARCHIVES OF OTOLOGY is $4.00 per year, payable in advance. The price per number is $1.00. The ARCHIVES is sent postage free in the United States, Canada, and Mexico.

The **Archives of Ophthalmology** is a companion journal of the ARCHIVES OF OTOLOGY with the following differences: The editors are Dr. H. Knapp of New York, and Dr. C. Schweigger of Berlin. The title of the German edition is *Archiv für Augenheilkunde*, edited by Dr. H. Knapp and Dr. C. Schweigger. The bi-monthly numbers are issued alternately with those of the ARCHIVES OF OTOLOGY, beginning with January. The annual volumes contain about six hundred pages. Price, $5.00; single number, $1.00.

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VOL. XXXI. No. 2.

ARCHIVES OF OTOLOGY.

TENSION ANOMALIES IN THE SOUND-TRANSMITTING APPARATUS OF THE MIDDLE EAR.[1]

By CLARENCE JOHN BLAKE, M.D., OF BOSTON,

PROFESSOR OF OTOLOGY, MEDICAL SCHOOL OF HARVARD UNIVERSITY.

THE marked discrepancies in the statements of writers of text-books on physics and of physicists themselves, as to the upper limits of human hearing power, permitted the inference that the organ of hearing itself had not been subjected to a sufficiently critical examination and that the real cause for the observed differences in hearing lay in the tension anomalies of the sound-transmitting apparatus itself.

A series of experiments of a very simple character, made nearly thirty years ago, proved the inference to be correct and showed that, while the upper limit of sound transmission of the normal sound-transmitting apparatus of the middle ear in the human subject was a fairly invariable one, very considerable variations, both above and below the assumed normal, were the results of changes, either in the tension of parts of the intact apparatus or of changes involving solutions of its continuity.

The results of these experiments have been confirmed by later and more elaborate investigations, on the part of other observers, but the subject is still young and affords a varied, an interesting, and, for the progress of otology, an important field for original investigatory work.

The paths for the passage of sonorous vibrations to the percipient organ are so many, and the provisions for compensatory functions so varied, and the questions as to aërial and bone transmission, mechanical transmission, and the transmission of undulations through fluids in enclosed spaces are so closely related to each other as to make a long series of observations along more or less parallel lines and an equally extensive series of control experiments necessary to the arrival at any definite conclusions as to the exact functions of the sound-transmitting apparatus of the middle ear in the human subject, and the paper which you do me the honor of receiving and considering this evening is merely a short and a tentative step in this direction.

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[1] Read before the Section of Otology at the New York Academy of Medicine, March 13, 1902.

Coördinately considered, in reference to its functions, the normal sound-transmitting apparatus of the middle ear may be regarded as an acoustic balance with tension adjustments with its base, as regards tones of low pitch, outward, and its apex, as regards tones of high pitch, inward; as is illustrated by the fact that while the intact apparatus responds to, and transmits, tones no higher than those of from 45,000 v.s. to 50,000 v.s., attachment of the drumhead to the incus carries the transmission, and consequent perception, up to 65,000 v.s., while direct transmission of the sound waves to the stapes increases the limit to nearly, if not quite, 90,000 v.s.

Tension adjustment of the normal transmitting apparatus, afforded by voluntary contraction of the intrinsic muscles, carries the transmission limit but from 5,000 v.s. to 10,000 v.s. higher than the stated average, and beyond this point the intact drumhead and ossicular chain may be regarded as an obstacle to the transmission of tones of high pitch as well as a control apparatus of the intra-capsular transmission of sonorous vibrations received through the adnexa; and it is both as a transmitting apparatus and as a control apparatus that the membrana tympani and ossicular chain, with its attachments, must be regarded in the exact determination of any question in physiological acoustics, in which it is concerned.

A study of the effects of tension anomalies upon the transmission of musical tones implies, necessarily, a consideration of the excursions of the transmitting apparatus, not merely as a whole but segmentally, and, with this point in view, regarding the malleus as a pivotal centre, the long arm of the balance is the posterior and the short arm the anterior, corresponding to the longer and the shorter sound waves respectively, and, while the rotating effect upon the malleus of contraction of the tensor tympani muscle is slight, its action is such as to increase the tension of the posterior segment of the membrana tympani in proportion to the greater laxity of that part of the vibrating mechanism.

Experiments on sound transmission in the normal ear in the living subject, made by weighting different portions of the membrana tympani, by the attachment to its outer surface of small discs of paper, show that it is in the posterior segment that the greatest effect is produced, and conversely, when this portion of the membrana tympani has been abnormally relaxed, the artificial restoration of tension produces the more obvious effects upon the hearing.

Clinical observations show that with a moderate degree of increased tension of the sound-transmitting apparatus as a whole, such as comes from increased atmospheric pressure from without, incident to closure of the Eustachian tube, there is an increase in the transmission of tones of high pitch, but that at a point at which the atmospheric pressure becomes so great as to, have a damping effect the hearing for high tones immediately decreases, to the extent even of including the upper partials of the consonant checks.

Under these conditions the restoration of the patency of the Eustachian tube, without forcible inflation of the middle ear, and the reversal of the effect upon the sound-transmitting apparatus, by gradual exhaustion of the air in the external auditory canal, affords an opportunity for observation of the progressive restoration of the hearing for tones of higher pitch, the hearing for tones of lower pitch, with exception of the lowest limit, having remained throughout practically undisturbed.

It being assumed, on the basis both of anatomical structure and accredited experimentation, that the posterior segment of the membrana tympani responds in vibration especially to tones of lower, as well as, partially, to tones of higher, pitch, it stands to reason that the conservation of the tension of this portion of the sound-transmitting apparatus is most important to the proper transmission of the medium and compound tones within whose limit the speaking voice is represented. The relationship (of the malleus, with its tension adjustment) to this posterior segment may be taken as confirmatory evidence, for in no other part of the membrana tympani is especial compensatory provision for the maintenance of tension, beyond that effected by contraction of the tensor-tympani muscle upon the sound-transmitting apparatus as a whole, provided.

With its larger surface and lesser initiative tension, the posterior segment is especially liable to tension anomalies to a degree beyond the limit of normal compensation, and it is entitled therefore to more careful consideration than is sometimes accorded it by the clinician, for, given a stretching of the posterior segment beyond the point at which it counterbalances the continued traction of the tensor-tympani muscle, a malposition of the whole ossicular chain occurs, with a resultant interference with sound transmission, which makes itself especially evident in the decreased hearing for those qualitative overtones which demand accommodative provision for their proper transmission.

Measurements of the posterior segment, in its relation to the malleus, show that the shortest arc of vibration corresponds to a line drawn from the manubrium just below the short process, running at an angle of about 45° to the long axis of the manubrium, to the periphery, this being the point at which the membrane begins to rise from the level of its uniform convexity for attachment to the upper part of the manubrium and the base of the short process, and its posterior ligament; from this point downward the lines of measurement gradually lengthen, reaching their maximum, in the majority of cases, at about the middle of the posterior segment. An examination of the structure of the membrana tympani, in this portion, also shows an area close to, and following, the curve of the periphery, in which the paucity of circular fibres and the arrangement of the radiating fibres of the membrana propria are such as to render this portion much thinner than the general area of the posterior segment; it is widest and thinnest at the posterior superior periphery and gradually decreases in width and increases in thickness toward the posterior periphery, and it is precisely here that the objective symptoms of relaxation of the posterior segment, from undue tension, first show themselves, and are easily demonstrable on forcible Valsalvian inflation. In such instances it is interesting to note not only the effect upon the hearing in the decreased perception of qualitative overtones and the corrective result of the application of adherent paper discs or strips attached to the inner end of the canal and the thicker portion of the posterior segment, thus bridging over the relaxed portion, or of the application of contractile collodion to the relaxed part, but also to observe the peculiar relation which the stretching of the membrane has, not only to the perception of qualitative overtones, but even to the production of the voice in singers; stretching of the posterior segment of the membrana tympani being a not infrequent accompaniment of the flatting of the singing voice at points in the register in which the appreciation of qualitative overtone values is of especial importance, and not merely an accompaniment but a cause as well, as is easily demonstrated by an artificial restoration of the tension of this portion of the membrane, with a correspondingly immediate restoration of the quality of the voice.

The opportunities for the clinical observation of tension anomalies and their effect upon the transmission of musical tones have been largely increased since the introduction into general use of the various forms of pneumatic massage apparatus, which, while exceedingly valuable in some cases, are prone to over-use because of the readiness and simplicity of their application and the temporary relief afforded the patient by the consequent mobilization of the sound-transmitting apparatus as a whole, but it should be borne in mind that precisely as the ultimate expenditure of energy in phono-massage bears upon the ultimate vibratory and the perceptive apparatus, the proximate expenditure of energy in pneumo-massage comes upon that portion of the membrana tympani most subject, from its intrinsic structure and larger area, to the deleterious effect of excessive excursion mechanically induced. In this connection there is another point which has been made the subject of observation and which deserves more exact investigation. Repeated succussion of the membrana tympani, even to the limited degree induced by the auto-massage of Hommell, the volume of air in the canal being estimated at 1 *cc*, seems to stimulate contraction of the tensor-tympani muscle to an extent which materially decreases the mobility of the sound-transmitting apparatus, and correspondingly lowers the hearing for qualitative overtones. Experiments in this direction on the normal ear in which the auto-massage was continued for several days, at short intervals, resulted in a decrease of the hearing as mentioned, its restoration occurring only after a long period of rest or after the gradual exertion of a counteracting intra-tympanic pressure incident to the application of the familiar Politzer plug.

Forcible inflation of the middle ear, which is much less the practice now than formerly, and Valsalvian inflation, unless often repeated and long sustained, produce no more deleterious effects upon the vibrating mechanism of the middle ear than does the pneumo-massage apparatus with its direct application of a to-and-fro movement under the pressure of from 0.1 to 0.6 of an atmosphere.

Still another tension anomaly, less frequently observed, is that which occurs when a thickening of the membrana tympani itself serves to conserve the tension of its different portions and the expenditure of what may be termed a misplaced energy comes upon the malleo-incudal articulation. Repeated and forcible movements of the membrana tympani outward, especially when that membrane is thickened and interstitially resistant, serve in time to stretch the tendon of the tensor-tympani muscle and thus permit an exaggerated movement of the head of the malleus. This movement in its turn stretches not only the capsular ligament of the malleo-incudal articulation but also the lateral protective ligaments, or check bands, of the malleus, nor does the difficulty end here, for the repeated shocks from the inferior elevated border of the lower facet of the malleus upon the incus, tend to impair the integrity of the incudo-stapedial articulation under the uncounteracted contraction of the stapedius muscle.

For the purpose of determining the air pressure incident to the ordinary use of the pneumatic massage, two instruments were chosen as being those in most common use, the Sieglé pneumatic speculum and the masseur of Delstanche fils.

The Sieglé speculum was worked by means of a Reiner rubber bag 5.50 centimetres in diameter; with ordinary light pressure between thumb and first two fingers, the reading on the mercury column in the U tube was 14.5 *cm* as the mean of five readings, equivalent to 197.2 grammes[1] to the square centimetre or a little more than $\frac{14}{76}$ of an atmosphere.

With the same instrument forcible pressure gave, as the mean of two readings 23.1 *cm;* 314.16 grammes to the square centimetre, or $\frac{23}{76}$ of an atmosphere.

With the Delstanche instrument giving a piston stroke of 20 *mm* the mean of two readings was 65.5 *cm;* 896.8 grammes to the square centimetre or a little more than $\frac{65}{76}$ of an atmosphere.

With the same instrument at a piston stroke of 10 *mm* and 5 *mm*, the mean of two readings gave 49.8 *cm;* 677.28 grammes to the square centimetre, or nearly $\frac{50}{76}$ of an atmosphere, and 35.1 *cm;* 477.3 grammes or a little over $\frac{35}{76}$ of an atmosphere, respectively.

In cases of this kind, with excessive relaxation of long continuance, the decrease in hearing for tones of high pitch, due to the failure of the short sound waves to find transmission, is coupled with a loss of the distinctive voice overtones, which often fails of recovery even after the integrity of the malleo-incudal articulation has been artificially restored by bringing pressure to bear upon the short process of the malleus.

The reparative power, which works as if under the direction of a special intelligence, is nowhere better illustrated than in the human ear, in the remarkable degree to which fibrous structures can reinstate in proper relationship their component parts and is the basis of the spontaneous recovery of many of the cases of tension anomaly which come under observation, and there could be no better opportunity for the study of changes of tension in a fibrous tissue than that afforded by the membrana tympani, with a perceptive apparatus behind it and a wide range of musical tones as the index scale of the acoustic balance.

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[1] One pound = 373.25 grammes.

Relieved of the variations in air pressure which have impaired its tension, and therefore left to itself, the stretched posterior segment of the membrana tympani, unless it has been stretched to a point of disruption of parts of its fibrous coat, speedily seeks to take up its own slack, a process which can be materially aided by one or other of two procedures, one seeking to protect and to maintain the stability of the membrane, and the other, in addition, to encourage its contraction, the first of these procedures being the application of the familiar paper discs and the second the application of contractile collodion.

Returning now to the proposition of the acoustic balance, it is plain that the tension adjustment of the membrana tympani has its set-off in the ligamentous and muscular attachments of the ossicular chain, the distribution of weight in the latter having been found to serve as a counterbalance under tension of its attachments, and that, therefore, with any loss of tension in the membrana tympani changes must take place in the remainder of the sound-transmitting apparatus.

When these changes are the result of a relaxation of the drumhead of mechanical origin, such as comes with repeated closures of the Eustachian tube and other variations of air pressure, they are, comparatively, easily relieved; but when coupled with the results of congestive or inflammatory processes in the middle ear the determination of the extent and location of the tension anomalies, and of their appropriate treatment, becomes a matter of difficulty, and therefore of especial interest.

Grossly speaking, fixation of the malleo-incudal articulation interferes more with the transmission of tones of high pitch, and fixation of the stapedo-vestibular articulation with the hearing for tones of low pitch, but between these two extremes there are all possible variations, as might be expected in a problem with so many intermediate factors.

When, as the result of a chronic non-suppurative disease of the middle ear, the fixation of the sound-transmitting apparatus has been of long duration, the hearing, for the voice especially, has become much impaired, and there are also symptoms indicating not only an obstruction to the passage of sound in either direction, but evidence that the fixation of the sound-transmitting apparatus has reached a degree which exerts an inhibitory effect upon intra-labyrinthine transmission, in default of amelioration from treatment an exploratory tympanotomy may be resorted to for the purpose of determining, by tactile and tone test, the location and nature of obstructions which could not be detected by means of the latter form of test alone.

This operation, which has been heretofore sufficiently described, affords a means for exact diagnosis not otherwise attainable, at a minimum degree of risk to the remaining hearing, since no injury is done to the important parts of the membrana vibrans, and, after tactile examination of the mobility of the individual members of the ossicular chain, the flap, formed of the posterior segment of the membrana tympani, can be simply and accurately replaced with the assurance, if aseptic precautions have been duly observed, of a healing by first intention.

Early experience showed that this operation could be done without general anæsthesia, and later experience that it can be done without local anæsthesia, the patient, conscious throughout the whole procedure, being able to answer descriptively to the tactile and tone tests made during the course of the operation.

Among other experiences, illustrating the inhibitory effect upon the general hearing of extreme retraction and fixation of the sound-transmitting apparatus, an illustration afforded also in cases of stapes fixation following suppurative disease of the middle ear, is an improvement in hearing in the ear not operated upon as well as a general sense of relief from pressure in the head.

Under the same causative conditions in many of these extreme chronic cases, the parts, if they have been mobilized merely, at the time of the exploratory tympanotomy, tend to return shortly to their former condition, and operative interference of a more final character becomes necessary, if anything is to be done at all; under these conditions the preliminary exploratory operation has served to determine the most serviceable course to be pursued, with the purpose of at least ameliorating a condition which is, to many patients, most burdensome, for, in all that pertains to this question of tension anomalies and their treatment, it should be borne in mind that a little help is sometimes of great importance to the individual who receives the improvement, while but a small percentage of the normal hearing is a large percentage of the hearing which the patient has at command. In the light of the brilliant surgical successes and major achievements in otology, the minor possibilities of help must not be forgotten, for, to aid toward wholesome and useful living is as much one of the duties of the medical profession as is the saving of life itself.

A CASE OF CEREBELLAR ABSCESS AFTER INFECTION THROUGH THE LABYRINTH. DEATH FROM MENINGITIS. AUTOPSY.[1]

By Dr. ARNOLD KNAPP, New York.

C. P., male, aged twenty-six years, was admitted to the New York Ophthalmic and Aural Institute on Jan. 22, 1892, suffering from purulent otitis media of left side, accompanied by severe headache and vertigo. The ear had discharged for many years, and the hearing had been much diminished. The acute symptoms had existed for several weeks.

On admission, depth of left canal is stenosed and occluded by a granulating mass apparently projecting from above and back. Thick and fetid pus escaped at the edge. No mastoid tenderness. The pain was referred to the side of the head. Presumably no hearing. No objective vertigo. Eyes normal. T. 102.4°. P. 110.

Operation, Jan. 24th.—At a short distance beneath mastoid cortex a cavity is entered filled by a cholesteatoma with a distinct limiting membrane. The cavity is a very much enlarged antrum, and extends down, out, in, and forward of the usual boundaries. The capsule of the cholesteatoma is easily stripped from the underlying bone, which appears smooth and polished. An irregular white structure occupies the site of the external semicircular canal; external to this the posterior bony wall of the auditory canal is defective and filled with granulations. On their removal, the facial nerve is exposed in its downward course, and a large defect exists in the anterior half of the external semicircular canal. The tympanum contains granulations, but no ossicles.

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[1] Read in abstract, with demonstration of the brain and temporal bone, at the Otological Section of the New York Academy of Medicine, Feb. 13, 1902.

The oval window is enlarged and discolored; granulations can be seen in the vestibule. The external semicircular canal is removed posterior to the opened lumen, establishing free communication with the vestibule. No pus was found in the labyrinth, and there was no fistulous tract on the inner wall of the tympanum or antrum. The operation was completed, and the wound closed.

The patient subsequently appeared to be doing well, except that the temperature remained up between 100° and 101.6°, with corresponding pulse rate, occasional pain over the left brow, and insomnia. On February 9th, the temperature was down, and he was allowed to leave the hospital on February 14th. The wound in the depth had shown no tendency to heal.

The patient was readmitted on February 19th, as he had suddenly become worse, and complained of very severe headache and nausea. There was slight left facial paralysis, and nystagmus accentuated on looking to the affected side. No vertigo, but unsteady gait. The wound discharged considerable pus. T. 101.4°. P. 108.

Operation, Feb. 22d. — The wound was re-opened, and all granulations removed. No pus or fistula to be seen. Starting back of the facial nerve the wedge of bone covering the cerebellar dura was removed. A probe introduced between dura and petrous bone in various directions revealed only healthy conditions. The oval window was enlarged downward, and the promontory wall removed. The vestibule contained greenish granulations. The tegmen tympani and the adjacent bone to the superior semicircular canal were removed, exposing healthy dura. Finally, the cerebellar dura was incised; no unusual amount of cerebro-spinal fluid escaped.

During the following five days patient was at times restless, with some delirium; slightly stuporous, though always easily aroused. Eyes normal. Nystagmus, vomiting, facial paralysis more marked. Temperature between 99° and 102.8°. Pulse about 120. Some pain in the back of neck.

On the day following, his condition had changed for the worse. He was comatose, and passed urine involuntarily. The pulse dropped to 80, hard and full, though the temperature remained high. Lumbar puncture drew off a faintly clouded liquid, with increased leucocytes.

Operation, Feb. 28th. — The posterior surface of the petrous bone was removed; first, exposing a healthy sinus, then, proceeding inward, with the object of getting as near to the internal auditory meatus as possible, the semicircular canals and the cochlea were removed. The cancellous bone at the apex of the petrous pyramid was laid bare, and appeared congested and discolored, but there was no free pus. The cerebellar dura was incised horizontally; congested meninges protruded; the cerebellum was punctured in various directions with a knife without result. The dura of the middle cranial fossa was likewise incised; puncture of the cerebrum revealed no abnormity.

The patient stood the operation well. Temp. 103 °; pulse 130; resp. 40. The symptoms of meningitis then became more pronounced, and patient died two days later.

Autopsy.—Purulent meningitis of convexity. Purulent infiltration at base, starting at the anterior perforated space, increasing on going back. The apex of the left lobe of the cerebellum is adherent to the dura on the posterior petrous surface at the site of the internal auditory meatus; the brain is here discolored. The pons, crura cerebri, and fourth ventricle are bathed in pus. The ventricles are filled with a purulent fluid. In the left cerebellar lobe in the region of the flocculus there is a small abscess cavity about 2 x 1½ *cm*, which extends forward and upward about the restiform body, filled with thick greenish pus and without a capsule. This abscess is separated from the adherent area of brain by ½ *cm*, and seems to have communicated with or ruptured into the fourth ventricle. The brain otherwise is normal, likewise the sinuses. The contents of the internal auditory meatus are swollen, matted together, and discolored.

In this case of chronic purulent otitis and cholesteatoma, complicated with caries of the labyrinth, the infection travelled through the internal auditory meatus, producing a pachymeningitis with adhesion of the cerebellar tissue, a cerebellar abscess in the flocculus which in turn ruptured into the 4th ventricle. At the first operation the original site of the disease was removed and the labyrinth freely opened. The latter structure contained no pus but discolored granulations. The operation seemed successful, except that the fever continued, and for the presence of pain over the left eyebrow and insomnia. Then suddenly very severe headache, nausea, slight facial paralysis, and nystagmus set in. As the labyrinth had unquestionably been affected for some time without causing any typical signs (except deafness), it seemed proper to search for an extension from the labyrinth and possibly a deep-seated extradural abscess before the meningeal symptoms became pronounced. This was done; the posterior and superior surfaces of the petrous bone surrounding the semicircular canals were exposed and appeared healthy, nor could any fistula be found. No particular change followed in the symptoms until, on the sixth day, the pulse-rate which had been 120 dropped to 80, the temperature remaining high, and increasing stupor set in. Lumbar puncture was almost negative, *i. e.*, the fluid evacuated was practically clear. These three features strongly suggested an abscess, and, from the nature of the infection, one presumably situated in the cerebellum, near the internal auditory meatus. An attempt was made to get as near to this region as possible; the entire bony labyrinth was removed, the cerebellar dura was broadly exposed and incised, and the cerebellum was freely punctured, but without success. At the autopsy the abscess was found in the flocculus at a point even internal and anterior to the internal auditory meatus.

According to Okada,[1] who has published the most recent and very exhaustive monograph on this subject, a preponderating majority of cerebellar abscesses follow labyrinth suppuration and only one third are secondary to sinus disease.

Nystagmus was the only pronounced localizing symptom present in this case, and was accentuated on looking to the affected side. There were no other ocular symptoms. The misleading similarity of symptoms due to labyrinth involvement and those present in cerebellar lesions has been commented upon.

As regards the method of operating, the general rule to attack the brain focus at the nearest point to the path of infection is being generally accepted. Jansen, Koch, and Trautmann have recommended the removal of the posterior surface of the petrous bone, in other words the removal of the median wall of the antrum, in exploring for cerebellar abscess. The space between the sigmoid sinus and the posterior vertical semicircular canal varies, according to the researches of Okada and others, between 0.5 and 2 *cm*, and is generally sufficient to permit of an adequate puncture of the cerebellum. When the labyrinth is also involved, this area can, of course, be much enlarged. This was done in our case, and at autopsy it was seen that the posterior petrous surface had been removed to within 0.5 *cm* of the opening of the internal auditory meatus. Nevertheless, the abscess cavity was not encountered, owing to its unusually deep-seated and, it may be said, inaccessible location.

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[1] Okada: "Diagnose und Chirurgie des otogenen Kleinhirnabscess," Haug's *Klinische Vorträge*. Fischer. Jena, 1900.

TOXÆMIA FROM SUPPURATION IN THE TEMPORAL BONE.

By Dr. H. EULENSTEIN, of Frankfurt a. M., Gy.

Translated and Abridged by Dr. Edwin M. Cox, of New York.

ACUTE toxæmia following suppurative processes in the temporal bone is not very common, and has often been considered together with pyæmia and septico-pyæmia from the same source. I do not wish to include those cases in which there is first a thrombus formation in the sinus or the jugular vein, with a subsequent breaking down of this, and thus systemic infection, but I wish to describe a class of cases in which there are no symptoms of pyæmia, but a sudden and rapidly developing general infection.

In 1895, Grunert and Meier called attention to the fact that the lymph vessels were the probable channel of infection for cases in which there was no sinus phlebitis, and in 1896 Körner also expressed this view. Later, Meier adopted the view of Leutert, as expressed in *Arch. für Ohrenheilk.*, Bd. 41, p. 264. It appears to me worth the trouble to collect the cases bearing upon this matter and also to add some of my own observations. I have not in mind those cases in which the septic manifestations are caused by an extensive sinus or jugular involvement, since these do not require further explanation, and are sufficiently well designated by the names, pyæmia and septico-pyæmia. The cases to which I wish to call attention are: two of Körner's (*Die Otit. Erkrank. des Hirns*, etc., ii. Aufl., p. 94), two of A. Fränkel's (*Deutsche med. Wochenschr.*, 1894, No.

9), one of Eulenstein's (*Zeit. für Ohrenheilk. Bd.*, 30, p. 308), and two of Stanculeanu and Baup (*Le Progrès Méd.*, August 29, 1899). To these cases, I can add a short description of another.

A. B., æt. 11, had severe typhoid in 1900, but has escaped the usual diseases of childhood. On April 30, 1901, patient became ill with pain in the neck and ear, and there was fever, and very soon, purulent discharge from the right ear. Patches appeared on the tonsils next day and diphtheria antitoxin was employed, so that in three or four days the tonsils were clean, though the fever persisted. Right mastoid sensitive but not swollen. May 4th, headache and a morning temperature of 40.1° C., were the only noteworthy symptoms. Discharge from right ear continues profuse. During the next three days the patient developed an exanthematous eruption, resembling measles, beginning in the mucous membrane of the mouth and thence extending over the whole body. After three days this became less, and the temperature fell to almost normal, but the discharge from the ear continued profuse. On May 10th, there was a rise of temperature to 39.2° and the mastoid tenderness increased somewhat, so that operation was decided on and carried out at once. The mastoid cells were filled with pus and in some places with granulations, and the disease extended backwards as far as the sinus, which by the carious decay was exposed for a distance of ¾ *cm.* The wall of the sinus was accidentally torn at this spot and it was necessary to control the hemorrhage by tamponade. All of the diseased bone was removed as completely as possible and the usual dressing applied.

Two days after operation, May 12th, temperature 37.9° C., pulse 100, general condition very satisfactory. Early the next morning, the patient suddenly became worse, the pulse and temperature both rose, but the sensorium was so far unaffected. Later there was some improvement, but only for a time, when a sudden collapse occurred from which there was no rally in spite of vigorous stimulation. Six hours after the beginning of these symptoms, death.

The *Autopsy* showed some swelling of the spleen and moderate œdema of the lungs, but nothing in the head beyond a little serous infiltration of the brain, and a small area of nodular infiltration in the wall of the lateral sinus.

This case presents several points of interest. The occurrence of the exanthem, almost undoubtedly measles, at the particular time was remarkable, and probably contributed to the unfortunate outcome of the case. The possibility of an attack of measles had been considered, but since the eruption was delayed, we must attribute the first fever to the suppuration in the mastoid. The course of the eruption was like that of true measles, and not like that of an eruption due to sepsis. The involvement of the wall of the sinus was inconsiderable, and, judging from the appearance, only in its early stages. The toxæmia, therefore, did not result from the breaking up of a thrombus, but rather from the growth and development of bacteria in the blood after they had reached that fluid by penetrating the walls of the sinus.

The rapid course of the disease was due to the great virulence of the infecting organism, which did not allow time for the development of a thrombo-phlebitis and pyæmic symptoms.

Among the eight cases which I have mentioned as being similar to the one under consideration, there were two with chronic aural suppuration, and six with acute, and the ages varied from seven to forty-three. In two cases there was extensive infiltration in the region of the ear, which Körner looks upon as an evidence of a serious septic process. The time of illness varied from one day to three weeks. The fever was irregular and not characteristic, and chills occurred in only one case. Metastases did not occur; albuminuria occurred twice, and jaundice three times.

When the symptoms began, they, as a rule, became rapidly severe, and gave the impression that the toxines were cumulative in their action. Death usually occurred in deep coma.

In six cases radical operation was attempted, but in no case was permanent benefit attained, since every patient died. The autopsies naturally afford some points of interest. In nearly all the cases the organs of the chest and abdomen showed unimportant lesions. In two cases there were evidences of some thrombo-phlebitis, while in the other six there were no such signs, and in the few cases in which the jugular vein was examined in its entirety there were no gross signs of disease. In three cases, the bacteriological examination showed streptococci, and in the five others nothing.

These observations show that suppurative disease in the temporal bone may cause general infection in two ways. The inflamed wall of the sinus may permit the passage of the bacteria or their toxines into the blood, so that death may occur from toxæmia without any special increase in the inflammatory process, or the bacteria may be taken directly into the circulation by the large, and especially the small, vessels, and thus be permitted to increase with great rapidity in all parts of the body. We do not yet know why the same kind of micro-organism behaves with different degrees of virulence under different circumstances, though individual susceptibility must play some part. Powerful stimulation and saline infusion are important parts of the treatment, but the value of the antitoxic serums is not yet settled. In all cases it is important to remove the focus of infection as soon as possible.

THE INFERIOR OCCIPITAL PLATE OF THE MASTOID, WITH ESPECIAL REFERENCE TO BEZOLD'S MASTOIDITIS.

By JOHN DUNN, M.D., Richmond, Va.

BOTH in observing the occasional cases of Bezold's mastoiditis one meets in practice and in reading those reported, one is struck with the fact that some cases, after operation on the mastoid and after opening the deep abscess in the neck, get well uneventfully, while others develop complications and die. Of the latter kind, I recall in my practice two cases, one of which has been reported in these Archives; the history of the other, in brief, was as follows:

Right-sided mastoiditis of several weeks' standing. When first seen there was a deep abscess in neck in addition to marked evidences of mastoiditis. Mastoid and abscess in neck opened. Mastoid found to be filled with pus. Symptoms did not improve. *Right* lateral sinus bared and found to be healthy. Abscess in neck further opened. One week later swelling appeared along line of *left* jugular. Patient would not give his consent to further operation. Symptoms of thrombosis; meningitis; death. Autopsy. *Left mastoid, antrum, cells, and middle ear* perfectly healthy. *Left* sigmoid and lateral sinuses filled with pus; pus in *left* posterior fossa of skull. Disintegrating thrombosis of *left* jugular. Brain not examined.

Compare very interesting similar case reported by Dr. H. Knapp.[1]

Professor Guye[2] refers to Bezold's original article, and says that "this new method of extension consists in an abscess deep in the mastoid process, *perforating on the medial side*. The pus does not reach the surface, being prevented by the various muscular attachments on the outer surface and tip of the mastoid process." "Bezold produced this peculiar process artificially in the dead subject by opening the mastoid process externally, then perforating the medial wall with a gouge and injecting thick colored solutions which spread in the same manner as the pus." Knapp[1] reports a case of "the so-called Bezold variety of mastoiditis, viz., the pus had made its escape *through an opening in the medial side of the tip* of the mastoid into the digastric groove and the head of the sterno-cleido-mastoid muscle." In this case there was found a "small but distinct perforation leading into the digastric groove." In remarks on this case Dr. Knapp again refers to the perforation "*on the medial side of the tip* and extending down the neck alongside the sterno-cleido-mastoid muscle." Moos[2] says that Bezold "was the first to call attention to the fact that a mastoid abscess might open *toward the digital fossa* or *upon the internal* (medial) *surface of the mastoid process*, instead of externally. An anatomical disposition to such a course exists in those cases in which the lower portion of the mastoid process consists of a single large pneumatic cavity or of several such spaces bounded *internally only by a thin layer of bone*." Hegetschweiler[3] speaks of "acute empyema of the mastoid portion of the temporal bone, proceeding, in the manner described by Bezold, to perforation of the *inner wall of the mastoid process*." Guttman mentions "this type of mastoiditis, where the pus in the mastoid process has a tendency to break through the *lower inner table* of the mastoid process." Thus we see the accepted explanation of the so-called Bezold's mastoiditis takes into consideration only the "medial side of the tip" of the process.

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[1] Arch. of Otol., xxi., 239.

[2] Arch. of Otol., xxi., 318.

If we examine a series of temporal bones we find in far the greater number that the mastoid has a well defined projecting tip, on the inner side of which above is a deep groove, the digastric, and that internal to this the mastoid extends until it articulates with the occipital bone. This inferior occipital plate of the mastoid, if it may be so-called, is from one sixth to one quarter of an inch wide, and has a portion of the sigmoid sinus just above its inner table, and even projects beyond the sinus wall posteriorly. In a few cases we have no well defined tip to the process, no "medial side of the tip." The process in these cases is bulky and extends well back to the occipital suture; the digastric groove being represented by a slight indentation on the under surface of the mastoid. Here the inferior occipital plate is proportionately well developed.

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[1] ARCH. OF OTOL., xxi., 239.
[2] ARCH. OF OTOL., xix., 161.
[3] ARCH. OF OTOL., xxvi., 313.

In a very considerable proportion of cases *the inferior occipital plate contains air cells connecting with those in the process.* This is nothing new and yet one rarely sees in the details of reported mastoid work mention either of the inferior occipital plate of the mastoid or of its air cells. The digastric groove is the dividing line between the inferior occipital plate of the mastoid and the mastoid tip. We see further that the greater part of the outer table of the inferior occipital plate lies at a considerably lower level than the highest part of the digastric groove; and, moreover, the medial side of the tip is in many skulls from three eighths to half an inch from the occipital suture. The bone occupying this whole space, which is made up of the digastric groove and the inferior occipital plate of the mastoid, may be filled with air cells communicating among themselves and with the air cells of the mastoid. It is highly probable that purulent osteitis of this occipital plate with its air cells exists in the severer forms of Bezold's mastoiditis, and that the rupture takes place through its inferior, *i. e.*, outer table, and pus thus reaches the deepest structures of the neck. The operation for mastoiditis, as usually done, is ineffectual because, although "the entire tip and all the cells above it" be removed, the diseased portions internal to the tip, *i. e.*, the bone and cells constituting the inferior occipital plate of the mastoid, are left untouched. Perhaps all of us can recall cases operated upon for purulent mastoiditis where delay of healing was caused by a slight discharge of pus from the infero-posterior part of the wound. Here we had failed to explore the region above mentioned. There is another point we should bear in mind, viz.: the cells of the inferior occipital plate when full of pus must, because of the digastric groove, drain " up hill," unless the inferior table of the inferior occipital plate be perforated, in which case they empty their discharge into the deeper structures of the neck. The above observations may help us to understand why some cases of the so-called Bezold mastoiditis get well so readily, and why some are among the severest types of mastoiditis. In the former the rupture takes place through the medial side of the tip and before the structures in the posterior fossa become involved. In the latter the cells of the inferior occipital plate are diseased, and their drainage is worse even than that of the cells of the process, for it takes place through these latter; rupture of the tables for these cells means entrance of the pus inwardly into the posterior fossa either into the sigmoid groove or posterior to it, or, outwardly, into the deepest structures of the neck. Thus we see why the worst cases of Bezold's mastoiditis are often accompanied by meningitis of the posterior fossa, cerebellar abscess, and sinus thrombosis. From this we should learn to lay open freely the air cells of the inferior occipital plate in every bad case of Bezold's mastoiditis, and in every mild case where during operation we cannot find the direct perforation of the medial side of the tip to explain our deep abscess.

P. S.—The term inferior occipital plate of the mastoid has in the above article been used to signify that part of the temporal bone which lies internal to the digastric groove, its posterior boundary being a line at a right angle to the posterior end of this groove. The continuation upwards of this plate might be called the superior occipital plate of the mastoid, and while this plate also at times contains air cells and is the seat of extensive osteitis, it bears only indirectly upon the questions presented by Bezold's mastoiditis. The superior and inferior plates are directly continuous and the arbitrary dividing line has been selected only that this important part of the mastoid may in the future have a definite name.

SUPPURATIONS IN THE LABYRINTH.

By Dr. VICTOR HINSBERG,

ASSISTANT AT THE POLICLINIC FOR EAR, NOSE, AND THROAT DISEASES IN BRESLAU.

Abridged and Translated by Dr. RICHARD JORDAN, New York.

OUR knowledge of the suppurations in the labyrinth following otitis media is still very incomplete, although some valuable articles on the subject have been published in the last few years. It would appear that the labyrinth suppurations outnumber all other complications of middle-ear diseases and that they are at least of equal importance; yet, a general description of these suppurations remains to be written. I purpose to point out in this article the defects in our knowledge and to compile the abundance of isolated experiences. The records of our Policlinic afford some valuable additional data on the subject. In treating the matter systematically from different standpoints much repetition is unavoidable and may be excused.

I.—ETIOLOGY.

We know that the labyrinth can be infected in several ways: from the blood, from the cranial cavity, and from the middle ear. Only the last mode of infection will be considered in this article. Open pathways, such as lead from the cranial cavity to the labyrinth, do not exist between the latter and the middle ear. The two openings in the osseous labyrinth wall, foramina rotundum and ovale, are closed by membranes which resist the progress of an infection as strongly as the osseous wall itself. Politzer (1) has shown the existence of anastomoses between the blood-vessels of the middle and internal ear, suggesting the possibility of an infection through these channels. But I have failed to find a single case in literature where a suppuration of the labyrinth was found to have been caused in that way. We may presume, then, that a labyrinth infection from the middle ear is only possible through a perforation of the labyrinth wall.

The perforation may be of *traumatic* origin. Fractures of the base of the skull are very apt to extend through the petrous bone, with or without rupture of the tympanic membrane. Thus the way is opened for the immigration of micro-organisms from the external ear or from the Eustachian tube. Occasionally injuries occur acting directly on the labyrinth wall—knitting needles being most commonly reported as the cause of the accident. Most authors assume that the needle was forced into the vestibule through the foramen ovale and Fedi (5) could confirm this by an autopsy three years after the accident occurred.

Under the head of traumatic lesions we have to consider those caused by *operations*, the labyrinth being opened either *intentionally* or *accidentally;* the former seems to be attended with less danger. Of all the reported cases of extraction of the stapes, only one (Evers, 6) developed symptoms suggestive of labyrinthine infection. Although no fatal results of the operation have been reported, its danger should not be underrated. The puncture of the foramen rotundum, which also has been recommended for the sake of improving the hearing, seems an even more hazardous proceeding.

The healthy labyrinth has been opened when an intralabyrinthine suppuration was thought to be present. I could find no such reports in literature; our own experiences of this kind will be reported farther on. The operations were not followed by any serious symptoms. Far more dangerous than intentional operations on the labyrinth are *accidental* injuries.

The numerous fatal cases where meningitis followed the unskilful attempt at *extraction of foreign bodies* are mostly due to a perforation of the labyrinth wall. The frequency of such occurrences cannot be stated even approximately, as the majority of cases are not reported. The same may be true to some extent of the injuries occurring in *radical operations*. In special danger of being injured during this operation are the horizontal semicircular canal and the oval window with the stapes. In the early times of mastoid surgery, when the trephine was forced into the bone beyond the reach of the controlling eye, the chances of an accidental injury to the horizontal semicircular canal were considerably greater than they are to-day. Schwartze (10) has reported a case where in a desire to reach the antrum he pushed the drill deeper than he intended. Patient had severe vertigo immediately after the operation. The autopsy showed a perforation of the horizontal semicircular canal. The three canals and the vestibule contained pus. The cochlea was free from pus. The cause of death was sinus thrombosis.

Modern technique has materially reduced, but not entirely eliminated, the danger of such injuries. In cases of extensive destruction or anatomical anomalies, accidents might happen even to a skilful operator. Jansen (11) has reported nine such cases in his experience. The symptoms which followed were very characteristic and will be considered farther on. The hearing was not always diminished. None of Jansen's cases died as a result of the accident. In the majority of cases the symptoms disappeared within four weeks. Another accident occurring in radical operation is the dislocation of the *stapes*, caused as a rule by a somewhat aggressive curettement of the tympanic cavity. It is well to bear in mind that the stapedial region ought to be avoided in this procedure. Ossiculectomy through the external meatus also involves some danger to the stapes. About twenty-five cases of unintentional removal of the stapes have been reported ; another case occurred in our clinic. In most cases the accident was not followed by any untoward results ; in two of the reported cases diffuse meningitis set in following labyrinth suppuration. One case was published by Jansen ; eighteen days after the accidental removal of the stapes his patient died from meningitis, the meninges having been infected from an empyema of the sacculus endolymphaticus. The other case is described by Grunert in the annual report of Schwartze's clinic for 1895–1896. This case is of clinical interest inasmuch as the accident was followed by a period of marked improvement in the condition of the patient. On the eighth day, the pulse became somewhat irregular; on the ninth, vertigo set in; on the tenth, intense headache. On the fourteenth day, after a brief interval of apparent improvement, symptoms of diffuse meningitis appeared suddenly, to which the patient succumbed on the twenty-third day after the operation. At the autopsy the oval window was found open; the whole labyrinth was filled with turbid serum containing cocci. The infection had reached the meninges by way of the acoustic nerve. It is not improbable that a similar condition existed in other cases of meningitis after radical operation where no autopsy was performed. Of the two accidents occurring in radical operation, the dislocation of the stapes is decidedly more dangerous than the perforation of the semicircular canal.

Far more frequent than these labyrinth infections of traumatic origin are those which are due to the destructive action of *middle-ear suppuration.* It is difficult to estimate the frequency of such *destructive* processes. The experiences of recent years, however, have shown that labyrinth suppurations are a much more common complication of suppurations of the middle ear than they were supposed to be.

It is to be regretted that in the annual reports of the different clinics no column is allotted to these complications. In the first annual report of Koerner's new clinic (15), we see for the first time a division, "labyrinth suppurations following suppurations of the middle ear," with the subdivisions, "empyema of the endolymphatic sac," "empyema of the vestibule," and "operations on the labyrinth,"—a novel feature which ought to be generally adopted. I have compiled the cases of labyrinth suppuration reported in literature, being fully aware of the relatively small statistical value of such a compilation; for there is no doubt that many cases have not been diagnosed, and many of the diagnosed cases have not been reported. I have been able to collect the records of 198 cases where the extension of middle-ear suppuration into the labyrinth was demonstrated partly by clinical observation, partly by post-mortem examination. These cases are widely scattered in annual reports of private and public institutions, reports of operations, statistical compilations, etc. Not included are the cases of the Berlin clinic, published in two more elaborate and systematic reports — one by Jansen, " On a Frequent Complication of the Labyrinth in Suppurations of the Middle Ear" (11), and the other by Lucae, "On Carious and Traumatic Lesions of the Labyrinth" (16).

Jansen observed 137 cases of non-traumatic fistula of the labyrinth from 1889 to 1896, Lucae, 37 more from 1896 to 1899—a total of 174 in a period of ten years. The report fails to give the number of cases of middle-ear suppuration treated in the same period, from which the relative frequency of labyrinthine complications could be deduced. The 137 cases from the Berlin clinic will be considered apart from those collected by me. From the material of the Breslau Policlinic I can add the records of 22 cases.

Entrance of infection.—In only 61 cases out of the 198 of my collection, the entrance of infection could be located. The infection had entered through:

Fenestra ovalis	in 17	cases
Fenestra rotunda	2	"
Fenestræ rot. and ovalis	3	"
Fistula in horiz. semicirc. canals	27	"
Fistula in post. or sup. canals	5	"
Fistula on promontory	7	"

The infection is shown to enter the labyrinth most frequently through the horizontal semicircular canal, quite often through the oval window, rarely through the round window. The stapes may be completely or partially destroyed. In two of our cases (2, 20), no trace of the stapes could be seen under the microscope; in one (19), only the annual ligament was destroyed. In a case of Manasse's (59), one half of the foot-plate was missing and the opening filled in with granulation tissue. The comparatively rare destruction of the membrana secundaria is accounted for by its well protected position. Lately Brieger (58) states that in 4 cases of labyrinth suppuration out of 5 observed by him the infection entered through the foramen rotundum. The report fails to give pathological details. As to the frequency of fistulæ in the horizontal semicircular canal as given in the above table, it must be considered that the observations antedate to a greater part the introduction of the radical operation. In order to realize the importance of the horizontal semicircular canal as a place of entrance, we have to study the reports of recent years. In the report by Lucae (61), the number of fistulæ in the horizontal semicircular canal is given as 32, against 4 defects in the "labyrinth wall."

The relation between the number of defects in the horizontal canal and the total number of chronic middle-ear suppurations observed in the same period has been estimated by different clinics from 1.06 to 1.2 %. The number of such fistulæ, however, compared with the number of radical operations, varies considerably in the reports of different clinics and different years, as shown in the following table:

	Radical operations	Fistulæ in ext. semic. c.	In %
Jansen (60)	100–120	25	20.8–25 %
Lucae (61, 16) 1896–99	202	32	15.8 %
Koerner (15) Oct., '99–Oct., 1900	34	2	5.9 %
Manasse and Wintermantel (52) April, '96–April, '98	77	9	11.7 %
Breslau Policlinic Apr., 1899–Apr., 1900 Apr., 1900–Apr., 1901	33 26	7 3	21.2 % 11.6 %

While the frequent erosion of the horizontal semicircular canal is easily explained by its exposed position, it is difficult to see how the vertical canals which are not in contact with the middle ear can be invaded by a middle-ear process. And yet this happens not infrequently. Habermann (17), in the report of a carefully studied case of acute otitis, has first demonstrated how the infection extended from the middle ear through the petrous bone to the dura,—probably along the vessels in the fossa subarcuata. An extradural abscess developed, which eroded and broke into the superior semicircular canal, then into the vestibule, and from there through the oval window into the tympanum. We have observed a similar case, which will be reported elsewhere (Extension of suppuration through fossa subarcuata, erosion of posterior semicircular canal, cerebellar abscess). In a second case of Habermann's, one of the vertical canals seemed to have been eroded by an abscess in the petrous portion. Jansen reports 7 cases of labyrinth infection through the superior semicircular canal, and 5 cases of fistulæ in the common crus of the vertical canals, caused by a deep-seated extradural abscess. Such cases have to be well distinguished from those where the extradural abscess is the effect and not the cause of the infection of the labyrinth, although the resulting pathological conditions may be nearly identical. Another mode of labyrinth infection has been pointed out by Koerner (18). In virulent forms of acute otitis media, especially after scarlet fever, foci of extensive *necrosis* occur in the mastoid process as well as on the capsule of the labyrinth. In the latter case, a suppuration in the cavities of the labyrinth is inevitable.

Character of primary suppuration.—The infection of the labyrinth is far more frequent in chronic otitis media than in acute. In 89 cases out of my compilation, the middle-ear suppuration was acute in 18, chronic in 71, of which 21 were complicated with cholesteatoma.

In Jansen's 121 cases of defect in the horizontal canal, not one was due to acute otitis.

Jansen found cholesteatoma in 71 cases, tuberculosis of the middle ear in 16 cases. Reports of tubercular infection of the labyrinth are not so frequent as might be expected.

Barnick (21) thinks that the gradual invasion of the labyrinth in tuberculosis would account for the absence of characteristic symptoms. Besides, the tuberculous character of the middle-ear suppuration is frequently not recognized. Of 33 well observed cases of labyrinth tuberculosis which Barnick found in literature, both fenestræ were opened in 5 cases, the oval window alone in 2, the round window alone in 3. Quite frequent is the perforation of the promontory, which is known to be the favorite seat of caries in middle-ear tuberculosis.

2.—PATHOLOGICAL ANATOMY OF LABYRINTH SUPPURATION AND ITS EXTENSION INTO THE CRANIAL CAVITY.

The pathological process following the infection of the labyrinth depends on the character of the primary suppuration and on the mode of infection. A sudden invasion of one of the larger cavities of the labyrinth by a virulent process will lead to a more rapid and extensive infection than the slow erosion of the osseous capsule in chronic suppuration. If the *whole* labyrinth is infected, all its cavities may be found filled with pus, the soft parts congested and swollen. Not infrequently, however, the exudation is insignificant, so that macroscopically no pus can be seen, while microscopical examination shows distinct and extended round-cell infiltration. This condition is commonly found in cases of circumscribed infection. The exudation becomes quickly organized by vascular connective tissue, which may promptly ossify.

Habermann (22) found new formation of bone in cochlea, internal meatus, and aqueductus cochleæ in a case of only seven weeks' duration. On the other hand, we find destruction of the osseous labyrinth. The whole frame of the cochlea may become detached and exfoliated. The nervous apparatus usually undergoes rapid destruction. The infection of the labyrinth does not necessarily extend into all of its cavities, but may remain *confined* to one of them.

Jansen (23) reports a case where the autopsy revealed a "very small fistula in the anterior crus of the horiz. semic. canal; membranous canal congested and swollen; microscopic examination shows round-cell infiltration of its walls. Superior semic. canal, vestibule, and cochlea were normal, macro- and microscopically."

I found a similar condition in the following:

CASE I.—P. K., age sixteen. No labyrinth symptoms. October 4, 1900, radical operation for cholesteatoma. Fistula in horizontal external canal. Chloroform asphyxia. Death. Microscopical examination: cochlea and vestibule free from inflammation, also both vertical canals; anterior crus of membranous horizontal canal is thickened and infiltrated, the posterior crus is entirely destroyed.

In a second case reported by Jansen (24), the suppuration was confined to vestibule and horizontal canal. Isolated affections of the horizontal canal are very common, according to Jansen's experiences. Brieger (58) takes a similar view. In the cochlea also, the infection may, for a time at least, remain localized within a certain section. Grunert and Zeroni (25) describe the microscopical appearance of a labyrinth in a case of meningitis: "While the rest of the labyrinth was found to be normal, the scala tympani was nearly filled with round-cells. The membrana secundaria was infiltrated and covered with a layer of round-cells on both sides."

Other cases of a partial infection of the labyrinth have been reported by Steinbrügge (26), Scheibe (4), Heine (29). The number of exact microscopical examinations is hardly sufficient to justify Jansen's somewhat sweeping statement that "as a rule the suppuration of the cochlea is shut off from the vestibule and *vice versa.*"

The *extension of labyrinth suppuration into the cranial cavity* usually follows the normal openings in the bone for the acoustic nerve and for the aqueducts, infection through the internal meatus being the most frequent. The endolymphatic sac can be distended to a considerable size (size of a bean in Jansen's case), "Empyema of Saccus Endolymphaticus."

Congenital *dehiscence* may be mentioned as possible pathways of infection. Dunn (30) at an autopsy accidentally found a dehiscence in the superior semicircular canal of a negro. Besides these pre-existing pathways, the suppuration frequently opens up *new ways* through the labyrinth capsule. The layer of bone covering the vertical canals may be destroyed, the infection thus reaching the dura and giving rise to the formation of extradural abscesses described by Jansen (31). Jansen mentions that most of these complications develop in the course of neglected *acute* suppurations. I was able to examine a case microscopically where the labyrinth suppuration was about to perforate the superior semicircular canal.

CASE 2, reported in full by Krischke (48). Protracted acute otitis media. Dizziness. Radical operation. Vertigo relieved. Pyæmic symptoms ten days after operation; death eight days later (jugular-bulb thrombosis).

Microscopical examination.— No trace of stapes found ; young vascular connective tissue invading the vestibule from the tympanum. Semicircular canals filled with granulation tissue. Osseous wall at apex of superior canal is eroded, only a minute layer of bone separating its lumen from the dura.

In some rare instances, labyrinth suppuration may cause *jugular phlebitis* through the vena aqu. cochleæ or vestibuli. Jansen (24), in his article on sinus-thrombosis, mentions this possibility and cites a few cases where the infection occurred in that way. All pathways from the labyrinth lead into the *posterior* cranial fossa, the only exception being a perforation in the anterior crus of the superior vertical canal which might implicate the middle fossa. If the infection extends beyond the dura into the subdural space, *circumscribed* or *diffuse meningitis* or *brain abscess* results. Only cerebellar abscesses have been reported as caused by labyrinth suppuration.

3.—SYMPTOMS.

The symptoms of suppuration in the labyrinth may be caused (1) by the suppuration as such, (2) by the condition of the terminal nerve-organs contained in the labyrinth.

The suppuration as such may cause *fever*, but little is known about this symptom in labyrinth suppuration. In one of our cases (Case 15), where the infection of the labyrinth took place under our eyes, the temperature did not rise above 100.8° F. Other cases showed no increase in temperature. In most of Jansen's cases the labyrinth complication was not attended with fever.

More characteristic are the symptoms which are due to *irritation* or *annihilation* of the *function* of the labyrinth. According to Mach-Breuer's theory, the labyrinth contains two distinct terminal organs — the *acoustic* organ in the cochlea and the *static* organ in vestibule and semicircular canals. Irritation of the former causes subjective sounds; irritation of the static organ, vertigo and nystagmus. Destruction of the one causes deafness; destruction of the other, lack of balance. The latter condition has only been observed after the destruction of both static organs; after the destruction of only one its function seems to be taken up by the contralateral organ. Symptoms of irritation of the cochlear nerve have been observed in the incipient stage of labyrinth suppuration. Max (34), in a case of bilateral necrosis of the cochlea, noticed the following symptoms after the carious process had reached the left labyrinth: "After a short interval, during which the hearing was more acute than before (although the sounds perceived seemed to be changed in character), the hearing-power decreased very rapidly, with subjective noises and ringing, pain and giddiness." More important than this "*irritation*-symptom" is the "*destruction*-symptom" of defective hearing and deafness. Deafness was pronounced by Scheibe (28) the "constant and never-missing" symptom of labyrinth suppuration, a statement which has proved to be erroneous. Jansen has shown that very fair hearing is sometimes found in cases of isolated suppuration in the semicircular canals, and his observations have been confirmed by other authors. I can add two cases from our own material:

CASE 3.—P. G., brakeman, age twenty-seven. O. m. p. c., A. S. Frequent attacks of giddiness. No nystagmus. Wh.: r. 5 *m*, l. 1.5 *m*. March 29, 1901, radical op.; fistula in horiz. sem. canal.

The dizziness increased during the following days, but ceased after the first dressing. Wound healed promptly. July 26th, hearing-test, left ear: wh. 2.5 *m*, Weber to left; upper limit, Galton, 0.8 : 3.7 = 16,435 v., lower l. D.

CASE 4.—R. R., age thirty-seven, farmer. O. m. p. c., A. D. (acute exac.). Dizziness and headache for a week. Hearing r. ear: wh. ad conch., V. 5 *m*. Weber to r. Galton 1. 1. Nystagmus. July 26, 1901, radical op.; fistula in hor. s. canal. Nystagmus and dizziness disappear promptly. Wound still under treatment.

In all these cases the cochlea was probably free from inflammation. Most patients with labyrinth suppuration, however, are absolutely or practically deaf on the affected side. Very interesting are the symptoms of *disturbed static function*—dizziness, objective vertigo, and nystagmus. The dizziness may be so severe as to confine patients to the bed, the slightest movement of the head causing the most distressing sensations. Patients that are able to walk show a staggering gait, or what Moos called the "duck-gait." These symptoms of disturbed balance may be continuous or may appear in periodical attacks; they may come on spontaneously or after certain movements of the head; frequently they become noticeable only when the eyes are closed. Mechanical irritation of a fistula in the semicircular canals may bring on a severe attack of vertigo. Lately exact and elaborate examinations and experiments on the disturbance of the static function of the labyrinth have been reported by v. Stein (36) and Adler (39). Jansen (11) saw symptoms of vertigo in fifty-seven out of ninety-seven cases of uncomplicated fistula of the horizontal canal; in twenty-two of these, walking was difficult or impossible. Lucae noted vertigo in thirty out of his fifty cases. In nearly all the cases collected by me, the reports mention symptoms of dizziness. Of the twenty-two patients recorded at our Policlinic, only three showed no signs of static disorders. Habermann (17), however, states that in eighteen cases of acute labyrinthine suppuration, only eight had dizziness and ten had none. That the severest symptoms of vertigo diminish gradually and then disappear permanently has been frequently observed. An illustration and an explanation of this occurrence are presented in the following:

CASE 5.—S. D., twenty-three years. Recurrent otitis in puerperio. Pulmon. tuberculosis. Stupor, fever. R. proc. mast. tender and swollen; ear-canal stenosed; profuse discharge. July 18, 1900, radical op. Dec. 15, 1900, cavity epidermized, except small place on promontory, where rough bone is exposed. At the end of December, severe symptoms of vertigo appear suddenly. A deep fistula has formed on the promontory and is rapidly increasing in depth and width. The dizziness continues for six weeks with undiminished intensity; then it grows less and less and disappears altogether. Patient dies a few weeks later. Inspection of the wound shows that the cavities of the labyrinth are totally destroyed.

The question why the symptoms of dizziness are sometimes missing in cases where the vestibule and semicircular canals were positively diseased has not been satisfactorily answered. It may be that occasionally the maculæ and cristæ acousticæ in cases of circumscribed inflammation remain intact. But such a possibility would not account for the cases reported by Habermann (17), where macula acoustica and crista of the posterior canal were "necrosed and nearly destroyed," and where not the slightest sign of dizziness had been noticeable. Possibly Barnick is right when he states that the characteristic symptoms are missing in cases of very slow destruction. And the same might be true in very rapid extinction of the terminal apparatus.

The disappearance of vertigo after the membranous parts of vestibule and canals have been destroyed requires no explanation. The continuance of the symptoms could only be explained by a direct stimulation of the vestibular nerve [Barnick (38), has described such a case].

Vertigo is frequently accompanied by *nystagmus*. Jansen has first called attention to the frequency of nystagmus in labyrinth complications and has reported the result of his extensive clinical observations. The reports in literature collected by me contain nothing on the subject. Jansen saw nystagmus in every case of traumatic perforation of the horizontal semicircular canal; in the 97 cases of carious perforation, the symptom is noted as absent in 19, as present in 24. Jansen thinks that the examination for nystagmus was simply forgotten or neglected in the remaining 54 cases. Lucae reports nystagmus present in 31 per cent. of 289 cases of fistula in the semicircular canal and in every traumatic perforation. Nystagmus without vertigo is rather rare (Lucae, cases 18 and 23); vertigo without nystagmus not infrequent. Nystagmus disappears sooner than dizziness and vertigo; it is mostly horizontal, seldom rotatory. The oscillations are increased when the eye is turned toward the non-affected side. Jansen mentions that nystagmus is occasionally inconstant, and that it may be absent or present at different times of observation.

Unequal width of the *pupils* has been noticed occasionally in labyrinth suppurations. Cohn mentions it in his article (42) on nystagmus and we saw it in Case 4. Whether the symptom has any value or not, will have to be shown by further observations. *Nausea* and *vomiting* are quite commonly mentioned in the reports on labyrinth suppuration and may be considered a characteristic labyrinth symptom. *Headache* however is so frequent in chronic and uncomplicated otitis media that it has very little diagnostic value.

4.—COURSE AND TERMINATION OF LABYRINTH SUPPURATIONS.

Acute forms of purulent otitis interna are well illustrated in many reports on cases of traumatic origin, dislocation of stapes, fracture of base of skull, etc. The infection of the labyrinth may rapidly spread to the meninges and terminate fatally within a few days. In other cases considerable time may elapse before the meninges become infected. In Politzer's case (40) of a fracture of the skull, extending through both labyrinths, the accident was followed by complete deafness and by severe vertigo, vomiting, etc., which kept the patient in bed for four weeks. Two weeks later, when Politzer saw him, he seemed perfectly well, excepting his deafness and his somewhat staggering gait. Six days later, he had a sudden chill and died from meningitis after two days. Autopsy: Left tympanum normal; fissure through vestibule; labyrinth filled with pus. Infection extending through internal meatus. Right labyrinth, also opened by the fracture, contains some coagulated blood, but no pus. Here the meningitis set in seven weeks after the accident, without any warning and in the course of apparent recovery. In another case of Politzer's (2) the interval was twenty-eight days; in 2 cases reported by Scheibe (41), seven and sixteen days.

In other cases with alarming symptoms of meningeal irritation, the outcome has been favorable. In Schwartze's (43) case (injury with knitting needle) there was severe vertigo and profuse discharge of cerebro-spinal fluid. On the following day high fever set in with delirium and pain in the back of the neck. The alarming symptoms disappeared gradually after about three weeks. Recovery with deafness in the affected ear. The middle ear in this case was not infected, the labyrinth having been infected directly by the non-aseptic point of the needle.

Suppurations of the labyrinth following *scarlet fever* and other *exanthematous* diseases are usually of a very acute character: sudden appearance of severe vertigo and rapid loss of hearing function. These suppurations may heal spontaneously or may become chronic, frequently leading to *necrosis* of parts of the labyrinth. Out of seventy-eight cases of necrosis compiled by Oesch (19) twelve were caused by scarlet fever. Bezold's (35) report contains seven cases of exfoliation of the necrosed cochlea which were all due to scarlet fever. The time elapsed from the outbreak of the exanthema to the exfoliation was from one to thirty-nine years. The course of labyrinth infection in ordinary cases of acute otitis is usually less violent and sometimes very slow and latent. A case of Habermann's (17) with acute otitis media died from meningitis caused by suppuration of the labyrinth without having shown any symptoms whatever suggestive of an affection of the inner ear. A patient of Scheibe's (28) suddenly developed labyrinth symptoms after having been discharged as cured from acute otitis and mastoiditis (mastoid operation). He died three weeks later from meningitis.

Suppurations of the labyrinth from *chronic otitis media* may have a rapid course, but they are more often of a comparatively mild character. The onset, however, is frequently marked by more or less severe vertigo with nausea and vomiting. In *tuberculous* affections it has been noticed that the complete loss of the hearing function may precede the symptoms of static irritation—in accord with the slow progress of the inflammation through the promontory into the cochlea, and from there to vestibule and semicircular canals.

Intracranial complications of infections of the labyrinth are frequent. Of the 198 cases of my collection, the cranial cavity was infected in 108, and in 43 of these the pathway of the infection could be traced:

Porus acust. int.	in	25 cases.
P. a. i. and aqueducts	"	1 case.
Aqu. vestibuli	"	8 cases.
Aqu. cochleæ	"	1 case.
Fistulæ in vertical canals	"	8 cases.

The terminations in the reports were:

Recovery	in	92	cases.
Death from meningitis	"	60	"
From meningitis and brain abscess	"	6	"
From cerebellar abscess	"	13	"
From other complications	"	27	"

Of Jansen's 137 cases with labyrinth complication, 34 in all terminated fatally:

15 from meningitis.
2 from cerebellar abscess.
17 from other complications.

These figures show that *meningitis* is by far the most *frequent* complication of the suppurations of the labyrinth. In typical cases the diagnosis of lepto-meningitis is easily and promptly made, but under certain conditions, particularly in localized meningitis, the symptoms are not all characteristic, and the diagnosis may be difficult.

CASE 6 (reported extensively elsewhere, 44). Radical operation with removal of sequestrum from the cochlea. During the otherwise normal convalescence an occasional rise of temperature and severe backache were noticed and a slight optic neuritis became more distinct. These symptoms remained unchanged for many weeks and aroused suspicion of a circumscript meningeal infection. Diffuse meningitis developed suddenly and took a very rapid course. At the autopsy a circumscript meningitis was found which had spread recently along the subdural space and the meshes of the arachnoid.

A number of interesting observations have been reported by Brieger (45). One of his patients with suppuration of the labyrinth had repeated attacks of severe headache, vertigo, slow pulse, fever, and homonymous diplopia. Every time these symptoms were greatly relieved by a lumbar puncture. Patient recovered. I agree with Brieger's opinion, that the symptoms were due to a localized meningitis. Brieger, as well as Jansen (46), calls attention to the fact that the symptoms are very similar to those described in "meningitis serosa," and that they are most frequently observed in cases complicated with labyrinth suppurations. When the labyrinth infection extends through one of the eroded vertical canals, additional symptoms may be expected from the formation of an *extradural abscess.* Jansen (13) noted "one-sided headache, frontal as well as occipital, no fever, occasionally stiffness of the neck." Other symptoms are: neuritis optica, slow pulse, somnolence, and crossed paresis (47). Of the greatest interest is the *influence of operations* on the middle and the internal ear on the course of labyrinth suppuration. The elimination of the middle-ear process is frequently sufficient to allay the inflammation in the labyrinth, sometimes after a short interval of post-operative exacerbation.

CASE 7.—O. m. p. c., A. D. Vertigo for two weeks, increasing. November 1, 1900, chill. Temp., 39.3°. Nystagmus. Deafness A. D. Rad. op.: sinus covered with granulations. Fistula in horizontal canal. Temperature returns to the normal. Vertigo disappears gradually. Recovery.

In other cases, symptoms of labyrinth irritation appear or become more intense *after* the operation.

CASE 8.—O. E., age twenty-eight, laborer. O. m. p. c., A. D. No labyrinthine or intracranial symptoms. A large polyp is removed with snare and curette. The following morning: temperature, 101.3° F. Severe headache, vertigo, vomiting, slight stiffness of neck.

Immediate radical operation, September 19, 1899. Dura exposed by caries. Fistula in horizontal canal. Facial paresis after operation. September 20th. — Somewhat better. September 22d. — Temperature, 103°. September 22d–30th. — Temperature normal. R. eye: neuro-retinitis. L. eye normal. October 1st.— Temperature, 103.5°. Frontal headache. No retention in wound. October 5th. — Neuritis optica; also in left eye. October 7th–14th.—Even temperature up to 102.2°. Temperature normal after October 15th. No more headaches. Neuritis optica increasing until October 26th, when patient is discharged. Inquiry three months later; patient perfectly well and working.

In other cases the outcome has been less favorable, and it cannot be doubted that *operations* are sometimes responsible for the *extension* of latent *suppurations of the labyrinth* into the cranial cavity. Very instructive on this point is a report by Heine (29) of 63 fatal cases of uncomplicated meningitis observed in the Berlin clinic from 1887–1900; 22 of these infections were caused by labyrinth suppuration, and of these, some were not operated upon, others showed meningeal symptoms before the operation. In 10 cases, however, the first meningeal symptoms followed the operation very promptly. The primary suppuration was acute in 2, chronic in 8 cases. Symptoms of an affection of the labyrinth were present in 4 cases.

Brieger (45) and Gradenigo (49) have lately called attention to the danger of mastoid operations in cases of latent otitis interna.

Brieger (58) lost 5 patients from meningitis out of 169 cases where he performed the radical operation for prophylactic reasons. In all 5 cases the meningitis was due to a concealed suppuration of the labyrinth. I can report 3 cases where the mastoid operation probably caused the extension of the suppuration beyond the labyrinth (48).

CASE 9.—P. A., age nineteen. Mastoid operation for acute otitis media. On the seventh day, sudden appearance of meningeal symptoms. Death eight days later. Autopsy : meningitis. Labyrinthitis.

CASE 10.—C. R., thirty years. Protracted acute otitis media, A. D. Slight facial paresis; no labyrinth symptoms. Radical operation. Six days later: strabismus diverg., nystagmus horiz., incip. neuritis optica. On next day, dizziness. Meningitis. Death eleven days after operation. Autopsy : diffuse meningitis induced from right labyrinth. Microscopical examination later.

CASE 11.—H., age thirty-eight. Radical operation for O. m. p. c., A. D., with granulations. Three days afterward, sudden vertigo, nystagmus, fever. Very severe meningitis. Death four days after operation. No autopsy.

In a case reported by Heine (29), meningitis developed immediately after a cauterization with chromic acid. The autopsy showed suppuration of the labyrinth as the cause of the meningeal infection. The relation of cause and effect is less apparent where a longer period elapses between operation and the first onset of meningitis. This period was twenty and forty days in 2 cases of Heine's report.

CASE 12.—W. S., age forty. O. m. p. c., with granulations. Treated in dispensary for some time; lately sometimes dizzy. May 31, 1900.—Radical operation; small cholesteatoma in antrum. Slight facial paresis, increasing during the following days. Severe dizziness for about a week. Wound heals normally, and is epidermized after six weeks. Patient pretends to be feeling perfectly well. Five days after his last call at the clinic we are informed that he had died suddenly two days ago. No autopsy. We learned afterward from the physician who saw the patient that he died under the typical symptoms of meningitis, and we were told by his relatives that he had suffered from severe headache since the operation, but that fear of another operation had prompted him to dissimulate his symptoms.

The results of operations on the labyrinth itself will be considered farther on.

(*To be concluded.*)

REPORT ON THE TRANSACTIONS OF THE SECTION ON OTOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. JOSEPH KENEFICK, Secretary.

STATED MEETING HELD FEBRUARY 13, 1902.

EDWARD B. DENCH, M.D., CHAIRMAN *pro tem.*

Dr. Wendell C. Phillips presented a case of **Bezold mastoiditis without rupture of the drum membrane.** He said: I have just had an experience which is rather unusual, and it might interest the Section if I give the history of this case in brief. The patient was referred to me yesterday by Dr. McAlpin. She gave a history of severe pain in the ear for four weeks past, following an attack of grippe. Eight days ago the mastoid bone began to swell. When I saw the patient yesterday, there was external swelling and softening over the tip, indicating a Bezold case. But during all this time there had been no discharge from the external auditory canal. She volunteered the information that for some weeks she had felt pus in the throat. I gently inflated the ear, and I felt sure that I could see pus behind the drum, but there was no perforation. I sent her to the Post-Graduate Hospital, and this afternoon, under ether narcosis, I performed the typical mastoid operation. Previous to performing this operation, I made an incision through the drumhead, and thick, creamy pus followed upon withdrawing the bistoury. It was a typical Bezold case. Here we had a suppuration for four weeks, with the development of a mastoiditis and without a rupture of the drum membrane. The presence of pus I was able to demonstrate by incising the drum prior to operation.

Dr. Edward B. Dench: The case reported is certainly an interesting one. Cases of mastoiditis without involvement of the tympanic cavity occasionally are met with, but they are rare. These cases which present the typical post-auricular tumefaction are not so common in my experience; they are more frequent when this sign is wanting. I can recall a case at the Polyclinic Hospital in which there was no pus flowing from the canal, absolutely no swelling over the mastoid, but there was tenderness and excruciating pain ; in this case the mastoid was broken down. It seems to me that Bezold's perforation through the tip of the mastoid beneath the sterno-cleido-mastoid muscle explains the reason why so little pain and discharge from the ear is found ; the pus is evacuated in another way. The discharge in the throat is interesting, and perhaps it does occur once in a hundred times, but in the other ninety-nine the patient is mistaken.

Dr. M. D. LEDERMAN reported the history of a **case, which clinically simulated mastoiditis, but on performing an exploratory operation no disease of the mastoid was found.** The patient, a female, complained of pain in the ear, with marked tenderness on pressure over mastoid antrum and tip. Though some discharge of the ear had occurred previously, according to the patient's statement, none was seen at the time of operation. A temperature of 100 ° F. was present, but on incising the membrane, no pus came away, and the distinct rip of going through a thickened drum was heard. There was some swelling over the mastoid at this time, though the picture of the drum and adjacent tissue did not indicate an acute inflammatory process. Opening of the mastoid was postponed for twenty-four hours, and Leiter's coil was applied. The next day the temperature reached 103 ° F., and the swelling with pitting was more marked, together with increased tenderness on pressure. No pus was seen in the canal, but as the mastoid symptoms had progressed, the bone was opened. No disease was found in the antrum or tip. The wound was almost entirely closed with sutures. As the temperature kept slightly elevated, a ten-grain dose of quinine sulphate was given morning and evening, which brought the temperature to the normal line. The patient finally gave a history of malaria, and after she was discharged from the hospital she had another attack with fever, chill, and sweat. The latter symptoms were not present while she was under our observation ; if they had appeared we would naturally have suspected sinus thrombosis. The microscopical examination was negative. It is possible that obstruction in a tributary vein caused the œdema over the mastoid.

Dr. E. B. MEIERHOF read a paper entitled: **Does early treatment of acute inflammation of the middle ear prevent the more serious complications?** which is published in full in No. 1., p. 1, of this volume.

Discussion.—Dr. WENDELL C. PHILLIPS: It seems to me that the proper answer to the question asked in the title of the paper just read would be that the early treatment of acute inflammation of the middle ear, as a rule, prevents the more serious complications. I must say that I agree with the reader of the paper that the rule has many exceptions. A fairly large number of cases that come to us do not seem to be influenced, so far as the graver complications are concerned, by any local measures that we may apply. I have under treatment at the present time a case that resulted from a severe attack of grippe, which had lasted two or three days. On the third night there was a severe attack of otitis, the pain being very severe in character. The day following, I saw him, and found a bulging drum, and made a free incision. The ordinary measures of cleansing the canal were instituted and faithfully carried out. The next day the mastoid symptoms were quite marked, and had increased so rapidly that the patient was taken to the hospital. The ice coil was applied for twenty-four hours; by this time the mastoid symptoms had become so urgent that operation was no longer delayed. There was found an involvement of the entire mastoid process. Preventive measures employed in this case were all of no avail. There was one significant feature, however, that the pus was of a virulent type. I had it examined, and it was found to be loaded with streptococci and staphylococci. In those types of cases I believe that little can be done to prevent the more extensive complications that may arise, provided the anatomical conditions are favorable for an extension into the mastoid.

Regarding the increase of the number of mastoid cases in this city I question whether or not that is true for the past twelve years. In spite of the epidemics of grippe we are treating about the same proportion of cases now as we did twelve years ago. I presume that in the earlier days many mastoid cases died from meningeal complications and so were never heard of.

As to the prevention of chronic suppuration I have always taught that there should be no such thing as a chronic suppuration when the cases were seen early and were intelligently treated.

Dr. M. D. LEDERMAN: There is no doubt in the minds of otologists that grippe plays an important part in the affections of the mastoid. Only last week in my service at the Manhattan Eye and Ear Hospital I saw four cases of grippe mastoiditis. Three of these cases were operated upon and the fourth will be. In one case there was extensive disease of the lower part of the mastoid. In another case the whole of the mastoid was involved and the sinus was exposed for over an inch. In the third case, a child three months old, there were symptoms of grippe, sneezing, coughing, with history of grippe in the family; the mastoid was completely diseased. In children we are apt to have suppurative disease of the ear follow any infectious process. In the fourth case there was also a history of grippe; although only a serous discharge existed yet there were evidences of mastoiditis with slight temperature. In three of these cases the temperature was not high.

With regard to the anatomical peculiarities, we are apt to have the suppurative process assume large dimensions in cases where the antrum is low down. If the antrum is high up, with good drainage, we do not find the disease so extensive. I think that accounts for the fact that some cases in which the drumhead is incised get well promptly, while others go on to operation. Here we did not incise the folds of mucous membrane which act as a ball-valve in the middle ear. In such cases we must make deep and extended incisions. I remember distinctly a grippe case in a female, in which an operation was suggested, but she objected to having the mastoid opened. Here the drum was incised three times under an anæsthetic and three times without any result, yet the patient got well under good drainage and regular douching. I believe that absolute rest, free drainage, and the use of hot antiseptic douches are of great value in these cases.

Dr. Edward B. Dench: The paper is certainly an interesting one but, I think, there is one point that has been overlooked, although touched upon. In speaking of the anatomical peculiarities which were prone to cause involvement of the mastoid, and of others in which the mastoid was not involved, I do not remember whether anything was said about the appearance of the parts on otoscopic examination. Where the tympanic vault is the seat of the inflammatory process we are apt to have mastoid involvement. These cases are characterized by the presence of very little discharge when incised. In fact I have repeatedly incised the drum membrane in this situation and I have had the same experience that Dr. Lederman has had, getting a cracking sound such as is usual when a normal drum membrane is incised, and a puff of gas ; as the knife passed through the intra-tympanic folds there was an escape of gas which had been pent up there, and which was caused by the action of micro-organisms. Such cases are prone to go on to mastoid involvement. Clinically we can decide in a certain proportion of cases whether on the one hand we are liable to have mastoid involvement, or whether the patient is going to escape. If the upper part of the tympanic cavity is involved then look out for trouble. If, on the other hand, the lower part of the tympanic cavity is involved, with the signs of an acute inflammation, such as diffuse redness, everything looking angry, that case will not go on to a mastoiditis. Again, one must remember that the character of the infection makes a good deal of difference and the examination of the discharge from the ear, both by smears and cultures, is of value. Still, I have seen virulent streptococcus infection in which the mastoid was not involved. I have also seen cases in consultation where no streptococci were found and yet when the mastoid was opened it was found to be completely broken down. I am in sympathy with what Dr. Meierhof has stated, and what I have written during the past eighteen months will bear me out. I have placed myself on record not only regarding operating upon the mastoid when it is involved, but also, when in doubt, doing an exploratory operation.

Dr. Meierhof, in reply : I am certainly obliged for the discussion which my paper has brought forth, for really that was why I produced it. I did not pretend to tell anything new, but I did wish to get an expression of the members of this Section.

Some years ago I took the trouble to look over the reports of three of the largest institutions in this city which dealt with ear diseases, going back ten years, endeavoring to learn how many mastoid operations had been done ; the three institutions whose records I looked over were the New York Eye and Ear Infirmary, the Manhattan Eye and Ear Hospital, and the Ophthalmic and Aural Institute. In these three institutions during that time they performed as many operations as are performed to-day in two or three weeks at the New York Eye and Ear Infirmary. Now, whether mastoid operations are on the increase, particularly since then, I am unprepared to say ; there may be more cases due to influenza infection, but there were just as many cases of purulent otitis following scarlet fever, measles, and the other diseases of like character. I said that the mastoid operation was done more frequently now because of the greater confidence of operators in their work ; that has resulted in more operations but not in more cases.

I have seen many exceptions to what Dr. Dench has stated regarding the propagation of the inflammation of the upper and posterior part of the drum.

Another object of the paper was to bring out an opinion as to whether the early treatment of acute inflammation of the middle ear does prevent the more serious complications ; if such is the case then I think the profession is certainly remiss in not giving this subject the attention it deserves.

A new treatment for deafness from chronic catarrh of the middle ear.

A preliminary report.

Dr. W. H. Bates read this report and furnished the abstract here given.

Abstract.—The author first briefly referred to the pathology of the middle ear and particularly called attention to the presence of connective tissue as an etiological factor. *Indications.*—The cases improved had better bone conduction than air conduction for all the Hartmann series of tuning-forks. The treatment was only employed after other well known methods had failed to benefit the hearing. *Operation.*—The object of the operation was to obtain room for local treatment of the region of the oval window and was not to improve the hearing. An opening was made over the mastoid close to the insertion of the auricle. The posterior superior walls of the bony meatus were removed with a chisel until the antrum was exposed. The drum membrane and ossicles were removed. With the chisel the outer walls of the attic and aditus ad antrum were removed, converting the tympanum, mastoid antrum, and external auditory canal into one cavity with smooth walls. The skin incision was closed with sutures. *After Treatment to Improve the Hearing.*—The object of the after treatment was for the removal and prevention of recurrence of connective tissue from the inner wall of the tympanum. The writer had great difficulty in accomplishing this. As a rule the hearing was temporarily lowered after surgical and other procedures. To prevent infection antiseptic solutions were necessary. The treatment usually extended over several months before much benefit was obtained and this was in the writer's opinion the only objection to this method of improving the hearing in these cases. *Report of Cases.*—Only twenty had been treated during the past eight years. All were benefited and many to a marked degree. A few who before treatment were unable to hear a watch or ordinary conversation at two feet were practically cured.

Discussion.—Dr. WENDELL C. PHILLIPS: I confess that the boldness of conception, and the patience required, and the radical measures adopted, rather stagger me ; at the same time the results shown by the doctor in his paper prove that there may be some possibility of benefiting a small proportion of cases of this class. I can see but one possible excuse for undertaking so radical an operation, and that is when patients have not been relieved after all other modes of treatment have been exhausted in cases of advanced deafness and when they are willing to undergo any treatment that offers to them a hope of restoration of their hearing. I do not think that the results obtained in so few cases will settle the question as to the real value of this procedure. Still, I think there should be some way of accomplishing this result without resorting to measures so radical.

Dr. EDWARD B. DENCH : What most impressed me in listening to the doctor's recital of his cases was the improvement in hearing on the side not operated upon. I am inclined to stand on Dr. Bates's side, for I brought out that point at least seven or eight years ago. That was a point first brought out by Wharton Jones, and has been observed by all careful men since that time, that operative, or non-operative, measures upon the ear of one side will improve the hearing upon the opposite side. I have examined with great interest the cases brought here this evening, and I was much impressed with the perfection in the technique. We must remember that these were not suppurative cases, and I have no experience in operating on such cases. I confess that when I saw the title of the paper the procedure seemed to me to be rather a radical one. I have yet to be convinced of the necessity for such an extensive operation in the large proportion of cases, and I think many here will acknowledge that I am as radical in my work upon the middle ear as any one in cases presenting themselves for improvement in hearing. I am much interested in anything which will give us additional knowledge in this direction.

It is almost always possible to relieve the tension around the windows (either the round or the oval) through the canal; when that is impossible without removing the floor of the tympanic vault, I can see no objection to the procedure advocated.

Dr. LEDERMAN: I should like to ask Dr. Bates if he can offer any explanation of the clinical fact that the patient still hears better in a noise with the ossicles removed, than when they were present.

Dr. PHILLIPS: I should like to ask if Dr. Bates removed two or three ossicles.

Dr. GEORGE B. MCAULIFFE: It seems to me that Dr. Bates has struck a key-note in the treatment of these conditions which has hitherto escaped observation. Hearing is not due to simply stapedial mobility, but is due to the impact of sound waves upon the tympanic wall. Therefore any operation which tends to reduce the density of this wall improves the hearing. Yet I think that the treatment of Dr. Bates is entirely too radical. I think that measures can be adopted which will relieve the increase in the connective tissue and improve the hearing without resorting to tympanic exenteration.

Dr. JOSEPH KENEFICK: It is interesting to consider the effect of water and its influence upon the connective tissue in the middle ear. In history-taking we are always considering the question of diathesis, and it is a striking point to notice that a large number of people who are complaining of a chronic catarrhal otitis media are afflicted with chronic rheumatism or gouty tendencies. I think the gouty diathesis is an important element in the etiology of chronic middle-ear disease.

Dr. THOMAS J. HARRIS: It was not my privilege to hear Dr. Bates's paper, but through his courtesy I was permitted to see one of his operations a few days ago. Since then I have had no occasion to change my mind regarding this procedure. Disregarding its theoretical or its practical value, the one objection I would raise is as to our inability to get our patients to submit to such a radical procedure. For most of us this operation is going to be as a closed book.

I agree with the chairman and the last speaker in their statements that Dr. Bates is working in the right direction, but I wish he could give us a way to obtain the same results without resorting to such a radical procedure.

Dr. W. H. BATES: In answer to Dr. Lederman's question I can only say that I do not know why patients without a drum membrane hear better in a noise than in a quiet place. I have been working in this field for a long time, and I have tried many things before I resorted to the operation I have just described. To improve the hearing of these patients I wanted to reach the oval window. In the beginning I took out the drum membrane and the ossicles through the canal to accomplish that purpose. But in the chronic catarrhal cases I found this to be insufficient, because a mass of connective tissue had formed a plug in the attic so large and inaccessible that I was unable to remove it and make the hearing better. I remember one patient I had five years ago where I took away the drum membrane, the malleus and stapes, thus exposing the oval window, and yet I was unable to remove sufficient connective tissue to improve the hearing after three months' treatment. Later I did this operation, taking away the outer wall of the attic and the bone about the antrum in order to obtain room, and then I was able to improve the hearing.

DIAGRAMS ON BLACKBOARD.

I have never attempted to obtain this space by operating through the canal, but have always made an opening behind the auricle. With surgical precautions this wound heals by primary union. I believe that this radical operation is necessary in those cases where there is an anchylosis of the stapes and fibrous tissue covering the oval window. With this cause of deafness, *i. e.*, fibrous tissue covering this window, the only thing to do is to remove the stapes and the fibrous tissue.

As to the use of water, English and other physicians have been using it for years. In all cases I order the patient to drink three quarts of water each day both before and after the operation. In persuading patients to submit to this operation I have no trouble at all after I have told them the conditions present and the indications for this operation. When it is explained to them they rarely refuse.

STATED MEETING, HELD MARCH 13, 1902.

DR. HERMAN KNAPP, CHAIRMAN *pro tem.*

Dr. A. KNAPP read a paper published in full in this issue, p. 99.

Discussion.—Dr. EDWARD B. DENCH: We are indebted to Dr. Arnold Knapp for the report of his interesting case. It seems to me that the work of the Society is now in the right direction.

We can all remember the time when no otologist would have attempted such extensive operative measures as Dr. Knapp has described in his admirable paper. At the present time we all believe in dealing with these severe conditions radically, and in their incipiency, in the hope of relieving the patient. A short time ago I reported a case of cerebellar abscess in which the avenue of infection was through the posterior mastoid wall, directly through the lateral sinus. At the time of the operation all carious bone was removed, and careful examination, both by ocular inspection and palpation, by means of the finger and the probe, seemed to show that the bony walls were firm in every direction. For about a week after the operation the patient did perfectly well, the temperature being normal, and the general condition of the patient being in every way satisfactory. At the end of this time the patient suddenly became comatose and died in about three hours. The autopsy revealed an abscess as large as a hazel nut in the cerebellum. The outer wall of the abscess was formed by the lateral sinus, which was necrotic at this point. Examination of the bony covering of the sinus revealed a small necrotic area in the bone, not larger than the head of a pin. This had been overlooked at the time of operation. In this instance the cerebellum was infected by a contiguity of structure, the infection travelling directly through the lateral sinus.

Dr. Knapp's case is particularly interesting, as it shows that the infection occurred through the internal auditory meatus.

Dr. Cl. J. BLAKE read a paper on the **anomalies of tension in the transmitting apparatus in the middle ear** (published in full in this number, p. 89).

Discussion.—Dr. EDWARD B. DENCH: I was very much interested in the paper of Dr. Blake. I think we all agree that when Dr. Blake comes to New York to read a paper before our Society, we are to have what we might call a "mental feast." Certainly, we have not been disappointed to-night. The paper which the author has presented to the Section embodies much careful scientific research,—that sort of work which is done in the laboratory, and is, therefore, more difficult and more tedious to the investigator than the more interesting work which is done in the operating room. Clinically, I have observed interference with the perception of the upper notes of the musical scale, in cases of tension anomalies of the posterior portion of the membrana tympani. It has always seemed to me, however, that this interference with the perception of the high notes depends not so much upon the inability of the relaxed membrane to conduct the sound waves to the labyrinth, as upon the changes in labyrinthine pressure, which the variations in tension of the drum membrane must cause. As Dr. Blake has said, in some cases of increased labyrinthine pressure the upper-tone limit is elevated — that is, notes of a much higher pitch are perceived than are usually perceived by the normal ear. This seems to me to be merely hyperæsthesia of the labyrinth, due to pressure. In other cases, where the upper-tone limit is lowered, it has seemed to me that this pressure has been so strong or has continued for so long a time as to cause a temporary ablation of function of the lower portion of the cochlea, which, as we know, is that part concerned in the perception of the high notes of the musical scale. We frequently find, in cases where the drum membrane has been drawn inward for a long time, that the upper-tone limit is lowered to a marked extent, but that it becomes normal as soon as the equilibrium of the drum membrane is restored by catheter inflation.

I have made use of the paper discs, described by Dr. Blake, in the treatment of relaxation of the posterior segment of the membrana tympani, and have found the treatment successful in a certain number of cases.

Another tension anomaly which is sometimes met with, is the separation of the malleo-incudal articulation. In one case of this kind, this relaxation of the malleo-incudal capsular ligament was certainly due to pneumo-massage. The patient complained of subjective noises of a peculiar character, such as "crackling" or "snapping" in the ear, particularly when the head was in a certain position. These subjective sounds were also frequently aggravated by certain sharp sounds. In a second patient, complaining of similar symptoms, relaxation of the capsular ligament was due to the firing of a pistol close to the ear. Both of these cases made a complete recovery after the introduction into the canal of a small strip of paper, bent upon itself, and introduced into the canal, so that while the long arm of the bent paper strip rested against the anterior wall of the external auditory canal, the short reflected portion pressed upward and backward against the short process of the malleus, crowding the articulating surfaces of the malleus and incus together. This small paper splint was left in place for several weeks, and upon its removal the distressing subjective symptoms disappeared.

I have also been able to observe, as Dr. Blake has mentioned, the necessity of absolutely normal hearing in all vocalists. I have had patients come to me complaining that in singing they always sang flat. These patients were not conscious of any impairment in hearing. Careful tests, however, showed that musical notes were not perceived equally well with both ears, one ear appreciating the tone correctly perhaps, while the other ear would perceive the sound a half or a quarter of a tone lower. Upon relieving the aural condition, the patients found that they could sing true.

I was glad to hear Dr. Blake say that he considered pneumo-massage injurious. I have certainly seen positive injury follow its employment. There can be no question that the patient experiences a certain amount of temporary relief immediately after the ear has been manipulated in this way; but there is no doubt, also, that it does cause permanent damage in many cases.

Naturally, I am interested in the exploratory operations which Dr. Blake has mentioned, because I have for a long time been a champion of middle-ear surgery. I have, therefore, listened to what he has said upon this subject, with much pleasure. I am glad Dr. Blake believes that in a large number of cases we are warranted in doing an exploratory operation to determine the actual mobility of the ossicular chain. I can say from a large experience that exploratory operations, if carefully performed, do not imperil the organ of hearing in the slightest degree. When the operation is performed under proper technique, suppuration does not follow and the exploratory wound heals readily. It must be emphasized, however, that the strictest aseptic precautions must be observed in performing these operations. The procedure should be conducted with as much care as in performing graver operations upon other portions of the body. When properly done, I am convinced that the treatment of tension anomalies by surgical methods will afford relief to quite a large proportion of cases. I have never performed any of these operations without the use of a local anæsthetic. The first incision through the drum membrane must, of course, be painful, as the intact membrana tympani cannot be anæsthetized. After making a small incision into the drum membrane, it has always been my practice to introduce a sterile 20% solution of cocaine into the middle ear by means of a delicate cotton-tipped probe. In this way, both the margins of the incision and the tympanic mucous membrane are anæsthetized, and the remainder of the operation can be conducted without the least pain. It has also been my practice in these cases to use a sterile solution of the suprarenal extract, in order to control the slight hemorrhage which is so annoying in these operations. The sterile suprarenal solution is introduced into the middle ear by means of the cotton-tipped probe, and renders the operation practically bloodless.

The point mentioned, in regard to the improvement in hearing which follows in the ear not operated upon, was interesting. I have long insisted upon this fact. The observation is not original with me, but was made first, I think, by Wharton Jones. I have heard it disputed by many eminent authorities, and therefore am delighted that Dr. Blake confirms the observations which I have already made in regard to this point. When I remove the ossicles, in cases of chronic non-suppurative otitis media, in which both ears are involved, I almost invariably operate upon the ear first affected, and it has been my experience that even where improvement in the ear operated upon is but slight, the opposite ear not infrequently improves considerably. If we can operate upon the case before there is even pronounced labyrinthine involvement, then we can usually improve the hearing. If, however, the labyrinth of either side is involved to any extent, the outlook for improvement, as the result of operative treatment, is poor. In these cases we usually find that the inflammatory process beginning in the middle ear of one side gradually invades the labyrinth. When the ear of the opposite side becomes involved, it is usually the labyrinth which is first affected, and not the middle ear. If, then, by operating upon the ear first involved we can relieve the pressure upon the labyrinth of that side, labyrinthine involvement upon the opposite side will either not take place, or will take place very slowly. Experience has taught me that we are able to do a good deal for these patients if sufficient care is used in selecting proper cases for the operation. I am sorry Dr. Blake did not say what operative procedures he considered the best. My own experience has been that where, after an exploratory operation and freeing the stapes, the patient's hearing improves, this improvement is rendered permanent by removing the two larger ossicles and the drum membrane, so that the stapes can be directly under ocular inspection, and also so that it can be mobilized mechanically from time to time, if necessary. At a later period, it is possible by means of paper discs or a mushroom-shaped cotton-pledget, applied directly over the head of the stapes, to secure considerable mobilization of this ossicle by the action of sound waves which are continually entering the ear. I have found that the membrana tympani is not usually reproduced after it has once been removed. Occasionally it re-forms, but after removal a second time, is seldom again replaced.

Dr. WILLIAM H. BATES: I should like to ask if anything can be done to permanently increase the tension of the relaxed drum membrane.

Dr. BLAKE: Relaxation is most likely to occur in the posterior segment, and an application of collodion is, usually, the best means of dealing with it; the collodion not only gives protection to the stretched portion, but also a mechanical contraction which favors the return of the parts to their normal condition.

Dr. MAX TOEPLITZ: Six years ago I reported to the New York Otological Society the case of a musician, a member of the Metropolitan Opera House Orchestra, who played the violin; when he reached a certain note he experienced such peculiar symptoms that he stopped playing. He was so distressed by the tinnitus and rattling that he gave up his profession at the time. I tried the rubber discs mentioned by Dr. Blake years ago, in a former publication. I should like to ask if a similar observation has been made by any one, where certain musical notes of an instrument affected the tension of the middle ear.

Dr. BLAKE: I have seen such cases responsive to sustained musical tones, especially those produced by the violin, and also cases in which there was loss of the qualitative overtones, the result apparently of a relaxation of the articulation, but to have responsive sympathetic vibrations, giving peculiar sensations with particular notes, is certainly very rare. In some of these cases it is possible to detect the portions of the drumhead involved by touch with a light probe, gentle pressure abolishing the sympathetic vibration; in some cases the use of the collodion film helps toward detecting the relaxed portion, when by means of a magnifying-glass a light spot can be seen, but the use of the probe is usually the best.

Dr. THOMAS J. HARRIS: I should like to ask Dr. Blake if he will, in closing the discussion, touch upon pneumo-massage, *i. e.*, if he excludes it from his routine work and only uses it in certain cases.

Dr. BLAKE: Such cases occur with great thickening and great immobility, but stretching the drumhead is more easy than we think. My experience with the effects of pneumo-massage has taught me that it takes a long time to recover from the considerable stretching effected.

Dr. FREDERICK WHITING: I think Dr. Blake's paper particularly seasonable, because in our recent meetings mastoid surgery and its intracranial complications have engrossed the attention of all our members to the entire neglect of a branch of otology which, if less brilliant in its results, is at least equally worthy of discussion and study. Dr. Blake's classical contribution is difficult to discuss, because of the very advanced teaching which it offers, and because his experiments and experience with anomalies of tension in the sound-conducting mechanism is so far superior to that of most practitioners. I certainly agree with him that any line of study and research which renders more comfortable and happy the lives of a class of patients whose disability if unrelieved entails long years of misery, is as praiseworthy an achievement as a surgical operation which in an inflammatory disease may save life. I would like if the Doctor would state more at length his experience in relieving tension anomalies by mechanical, surgical, or other means, and how great reliance he places upon remedial measures directed toward the correction of allied tension of the posterior segment of the membrana tympani.

Dr. BLAKE: In even marked cases of stretched posterior segment, simple applications of collodion suffice in time to restore the normal tension. This treatment must be repeated at long intervals, and must be kept up for a long time. In some cases the application of collodion may be continued for a year or more, application being made once in three or four weeks only, and coupled with the Hommell massage. In the more severe cases, where the stretching is very considerable, a cone-shaped drum of fine fibres of silk interlaced with wax as a binding medium may be employed in the first stage of treatment. They can be easily adjusted and kept in position, remaining for two, three, or four weeks, until they are gradually removed by the normal growth outward of the lining membrane of the canal. In the more serious cases of posterior-segment relaxation, where the parts can be easily moved to and fro, the posterior segment may be incised and attached to the descending process of the incus. In this way union between the posterior segment and the incus is obtained, with the result of restoring the transmission of the qualitative overtones.

Dr. E. Gruening: In this interesting paper "On the Anomalies of Tension in the Membrana Tympani," I hoped to find for my own information some pathological observations regarding the part of the intrinsic muscles of the ear. Experimental research has failed to define the function of the tensor tympani muscle. This is also true with regard to the stapedius. The remarks of the speaker seem to show that he regards the tensor tympani as a muscle of accommodation. I should like to ask the speaker his reasons for this view.

Dr. Blake: The assumption that the tensor tympani is a muscle of accommodation is borne out by its anatomical structure, a long-bellied muscle with short bundles of fibres which, acting successively, are capable of keeping up a sustained tension which exerts itself unduly when the posterior segment becomes relaxed.

Dr. M. D. Lederman: I should like to ask Dr. Blake if he has ever come across any cases in which contraction of the tensor tympani muscle was voluntary.

Dr. Blake: Voluntary contraction of the tensor tympani has been found to carry the hearing limit upward from five thousand to ten thousand vibrations; such cases are rarely detected except in musicians.

Dr. Lederman: I have the power of contracting my tensor tympani at will. By placing your ear close to mine you can hear a distinct sound.

Dr. Blake: I should like to ask Dr. Lederman if, in exercising such a contraction, he is conscious of the action of adjacent muscles.

Dr. Lederman: No, but I can voluntarily contract some of the extrinsic muscles which are attached to the auricle. The tensor-tympani contraction is independently a voluntary act.

Dr. Blake: There is a physician in Boston who can do this beautifully, but he also is a musician. He contracts the tensor tympani without apparent effort, and the hearing of the tone to which he is listening rises in pitch. I believe that, in doing this, he makes an effort with other muscles, and that the voluntary power over the tensor tympani muscle is not so complete as to enable it to act without assistance from adjacent muscles.

Dr. Blake: In writing this paper I had in mind the operation to which Dr. Whiting refers. In cases where Kessel's operation has been done, the head of the stapes is drawn against the tip of the pyramid by contraction of the stapedius, and the hearing is consequently poor; by doing a tenotomy and restoring the mobility of the stapes, then introducing a cotton vaseline drum, the hearing is improved. Tenotomy of the stapedius is an important addition to the operation of Kessel.

In the hearing of the tuning-fork by bone-conduction it is sometimes a question as to whether the tuning-fork vibrations are conveyed directly through the bones of the head or transmitted through the medium of the sound-transmitting apparatus to the labyrinth. Apparently the sound waves travel in both directions, and in this connection Dr. Knapp's theory, that the sound-transmitting apparatus is a control apparatus, should be had in mind, there being many cases in which hearing by bone-conduction is restored by opening the Eustachian tube, and inflating the ear. I should like to ask Dr. Knapp if he has continued his investigation as to hearing by bone-conduction.

Dr. HERMANN KNAPP: I have never made any experiments on bone- and air-conduction. By analogy of the perceptions by the other of the higher senses, that of sight, I have thought that bone-conduction would give us quantitative perception of sound, as we perceive light and darkness when we close our eyes, but the distinction of form or color only through the refracting apparatus. In the same way we might require the help of the terminal apparatus, the membrana tympani, ossicles, etc., to differentiate sound impressions into their qualities, pitch, intensity, and color. The phonograph lends support to this hypothesis by receiving the sound waves and recording them on a movable plate, which in return sends the tracings back into the ear, where the membrana tympani takes them up and transmits them, as to pitch, intensity, and clang tint (timbre), to the perceptive apparatus in the cochlea.

Dr. BLAKE: I should like to ask Dr. Dench as to his method for performing exploratory tympanotomy.

Dr. Dench: (Black-board illustration.)

Dr. BLAKE: Within the last few years a maximum of papers read have dealt largely with surgery, *i. e.*, surgery of the brain and surgery of the mastoid, and there has been a paucity of papers upon other subjects, equally important to the progress of otology.

Executive Session: The following resolutions were passed:

NEW YORK ACADEMY OF MEDICINE.— SECTION ON OTOLOGY.

RESOLUTIONS ON THE DEATH OF EDWIN M. PYLE, M.D.

WHEREAS, it has pleased the Almighty to suddenly call from us our esteemed and respected colleague, Dr. Edwin M. Pyle, and,

WHEREAS, for several years past he had zealously devoted himself to the special field of Otology, distinguishing himself in the hospital by his unselfish industry and superior skill as an operator, and winning in these meetings the esteem and admiration of his colleagues for his sincerity of purpose and genuine devotion to the advancement of this branch of medical science,

Therefore be it Resolved, That while we accept submissively the decree of Divine Providence, the members of this Section as associates in the field of Otology and as co-workers in the New York Eye and Ear Infirmary, to which deceased was attached, desire to record the sense of loss which they have sustained in the sudden taking away of their fellow practitioner, and,

It is further Resolved, That the members of this Section extend to the family and friends of the deceased their heartfelt sympathy and sincere condolence in their bereavement, and that these resolutions be spread upon the records and a copy be sent to the family and to the medical journals for publication.

Signed {
JAMES F. MCKERNON, M.D.,
FRANK J. BLODGET, M.D.,
JOSEPH KENEFICK, M.D.,
Committee on Resolutions.

March 13, 1902.

REPORT OF THE TRANSACTIONS OF THE NEW YORK OTOLOGICAL SOCIETY.

BY DR. ARNOLD KNAPP, SECRETARY.

MEETING OF MARCH 25, 1901. THE PRESIDENT, DR. H. KNAPP, IN THE CHAIR.

PRESENTATION OF PATIENTS.

Dr. WILSON presented a case of **empyema of ethmoidal and frontal sinuses** in a woman of seventy-two years, who had suffered for two years with headache and had been conscious of a growth in her nose. A fluctuating tumor formed at the upper-inner angle of both orbits, pushing the eyes down and out. At operation, an incision was made along the upper and inner margin of the left orbit and about two ounces of pus were evacuated. A cavity lined with smooth membrane was encountered, communicating with the other orbit. There were no granulations or carious bone. The case did well. The eyes returned into place, and the patient now has a fistula on the site of the original incision, which admits a probe, allowing it to pass in various directions to the depth of two inches.

Discussion.—Dr. GRUENING had recently operated on a similar case. The patient had complained of pain in the eye. Herpes corneæ and slight ptosis were present and there was tenderness over the lower wall of the frontal sinus. The sinus was opened and a considerable amount of pus evacuated. The entire lower wall was removed according to Jansen's method. The antrum of Highmore was then opened and it also contained pus.

Dr. WHITING said that he had operated on a case seven years ago. A fluctuating tumor was present which he simply opened and treated as a mastoid empyema. The case healed readily.

Dr. KIPP had operated on a case of empyema of both frontal sinuses where he removed the entire anterior wall of the septum. The case recovered with very little deformity. In another case of empyema where the patient died of non-septic pneumonia, the frontal, ethmoidal, and sphenoidal sinuses of one side were converted into one cavity; no trace of mucous membrane remained, and sharp spiculæ of bone projected from all sides.

Dr. QUINLAN had operated on 17 cases; 11 were single and 6 were double empyemas. He was in the habit of making his incision along the upper margin of the eyebrow; all the diseased bone and granulation tissue were removed, light packing introduced, and the wound allowed to heal by granulation. Drainage by the nose is disregarded and rather avoided as re-infection often occurs from that locality. If any deformity results, such as a depression, paraffine injections are resorted to and the cosmetic result accomplished is all that can be desired.

Dr. ARNOLD KNAPP asked what was the condition of the nose in Dr. Wilson's case. Dr. WILSON replied that before operation a probe had been forced into the cavity though the right nostril for diagnostic purposes, evacuating some pus. In conclusion Dr. Wilson said that he thought it was unusual to find so large an abscess cavity without any dead bone or granulation tissue, and he regarded it as a case of mucocele with absorption of bone by pressure.

Dr. HERMAN KNAPP spoke of the complications resulting from the **extension** of the suppuration **in two directions,** the one into the **cranial cavity,** producing pachy- or leptomeningitis and cerebral abscess, the latter frequently marked by no other cerebral symptom than a certain degree of fretfulness; he recalled a marked case of that kind where there was only a slight fistula at the junction of the middle and temporal thirds of the supraorbital margin. The abscess in the frontal lobe was found only at the autopsy. The **second direction** of the extension is toward the **other pneumatic sinuses of the face,** causing not infrequently neuroretinitis and blindness. A marked case with such sequences had been observed by him in consultation. Dr. Abbe opened the frontal and sphenoidal sinuses and tried to establish drainage by introducing a band of aseptic gauze through the frontal and sphenoidal sinuses into the pharynx. The band had to be removed the next day, being unbearable. The patient recovered, but remained blind.

Dr. KENEFICK presented a patient, aged twenty-five, with **disturbance of equilibrium**, who had received a glancing blow from a bullet when three years of age. The scar of a scalp wound at the upper border of the right parietal bone could still be seen. She had never been able to walk in a straight line, and on standing with her eyes closed unconsciously fell backward and to the right side. There is evidence of beginning middle-ear sclerosis but none of definite labyrinthine involvement. The opinion of the Society was asked regarding the probable site of the lesion.

Discussion.—Dr. BACON asked whether any weakness or paralysis of the seventh nerve had been observed, and whether the patient had been examined by a neurologist. Dr. Kenefick replied, No.

Dr. H. KNAPP thought there was slight facial paralysis present, the patient having a tendency to draw her mouth to the right side. He further quoted some cases published by Politzer, of old fractures of the base producing similar symptoms.

Dr. DENCH thought that in all probability there had been a fracture at the base of the skull upon the right side from the impact of the bullet upon the convexity of the cranium. It also seemed likely that this fracture had passed through one of the semicircular canals, probably the horizontal, and that this lesion accounted for the vertigo.

Dr. KIPP cited a case of a boy who had a tendency to fall always to one side. A cerebellar tumor was suspected and found to be situated in the middle line.

Dr. ARNOLD KNAPP presented a patient on whom a **radical operation** had been done with **primary skin grafting.** A single Thiersch graft was applied to the labyrinth wall and facial spur. This had simplified and shortened the after-treatment. During the operation the stapes was inadvertently extracted, and the patient's hearing after operation has decreased, contrary to the experience recently published.

Dr. DENCH said he had never applied skin grafts according to the Thiersch method at the time of the primary operation. He reported a case operated upon several weeks ago in which the patient, a man, came to the clinic with the history of an acute mastoiditis. At the time of operating there was a fluctuating postaural tumor. Upon incision of the soft parts and entering the mastoid in the typical manner, the entire mastoid was found to be broken down. The tympanum had evidently been the seat of a suppurative process for a number of years. The destruction of the bony tissue was so extensive that during the operation the lateral sinus was exposed, and a large dural area was also laid bare at the floor of the middle cranial fossa. A complete operation was done at this time, but owing to the extensive exposure of the intracranial structures, it was not deemed wise to close the wound. Two quadrilateral flaps were cut from the concha and meatus and were pushed, the one upward and backward and the other downward and backward into the posterior wound by means of an iodoform gauze packing inserted into the external auditory canal. The posterior wound was also packed, in the usual manner. At the end of a week, as the patient's temperature had remained normal throughout, and as the wound was in excellent condition, these meatal flaps were sutured in position and the posterior wound entirely closed. At the end of a week the posterior wound had healed throughout, but the large surface covered with healthy granulations, comprising the entire middle-ear and mastoid cells, was left exposed through the external auditory canal. As the external auditory canal resulting from this plastic operation was very capacious, Thiersch grafts were applied through the meatus, the posterior wound not being opened. These grafts took perfectly, and the entire cavity was covered with epidermis in the course of a couple of weeks.

Dr. WHITING asked Dr. Knapp how the graft was retained in place and what dressing was applied. Dr. KNAPP replied, By simple pressure and plain gauze dressing.

VOLUNTARY CONTRIBUTIONS.

Dr. BACON reported the case of a child who, after **severe measles,** suffered from earache; temperature 104°. There was a perforation of the left drum, and the right drum was congested. A free incision was made in each drumhead. From the right ear otorrhœa set in; temperature went down. Some bronchitis was present, and three days later, the temperature having again risen, the paracentesis openings were enlarged. Mastoid processes were tender; temperature went up to 104.5°; both mastoids were opened. Pus and broken-down tissue were found. Temperature dropped 2°. Respiration 52. General condition poor. The patient vomited more or less the two days following the operation, and on the third day she died. The temperature varied from 102.2° to 102.8°, pulse 130, and respiration 40–52. Although pneumonia was suspected, the physical signs could not be made out.

Dr. Bacon asked for information as to whether other members of the Society had met with severe complicating mastoiditis after measles.

Discussion. — Dr. GRUENING reported a fatal case of otitis after measles in a girl fourteen years old. She had had earache on the seventh day. The drumheads were slightly red. Paracentesis evacuated serum. The mastoids were very tender; temperature 106°; patient delirious; symptoms of meningitis pronounced. Mastoids were opened and found filled with pus and carious bone, the diseased process having exposed the sinus. Sinus appeared normal. On the third day pyæmic temperature set in and the sinus was incised. On incision about one ounce of clear serum was evacuated. Below, a clot was found. Jugular was tied. Patient died. Autopsy not permitted. In another case the disease resembled an osteomyelitis of the mastoid where the ear was secondarily involved. Fatal termination.

Dr. KIPP had also observed some severe cases of otitis after measles and had lately had a case which again demonstrated the necessity of ophthalmoscopic examination early in the disease. In a case of otorrhœa, of only a few weeks' standing, the mastoid was tender, there were no fever and no symptoms pointing to intracranial disease, and yet double optic neuritis was present. Thrombosis of transverse sinus found at operation.

Dr. BRANDEGEE had observed a case of **severe measles** followed in two weeks by otorrhœa. Mastoid was tender. At operation the bone was found necrotic, and fetid pus was present. Sinus exposed. The patient apparently recovered. Two weeks later temperature rose to 104°, then 106°, and dropped on the following day. The pyæmic character continued for two weeks. The patient recovered. Dr. Brandegee thought it very unusual to encounter this pyæmic infection at so late a date.

Dr. DUEL in quite a large experience had found that the mastoid was rarely involved in a straight case of measles. He also thought that otitis does not so frequently follow measles as it does scarlet fever and diphtheria.

Dr. DENCH had recently operated upon a case of **severe mastoiditis,** in which, during the course of the operation, the sinus was exposed. The patient did very well, and was discharged from the hospital at the end of about two weeks. Six weeks after the operation, the patient complained of feeling poorly and was readmitted to the hospital. About twenty hours after admission, the temperature suddenly rose to 106°. During the next twelve hours the temperature fell to normal, but in the course of the next twelve hours, again rose to 106°. The wound looked perfectly healthy, the external auditory canal was dry, and there was a diffuse, brawny swelling occupying the region of the parotid gland on the affected side. The patient was immediately anæsthetized and the lateral sinus exposed in the former operation wound. The sinus contained a softened clot. Upon the removal of this by means of the curette, hemorrhage was obtained from above, but none occurred from below. The jugular was then exposed in the neck from the clavicle to the base of the skull. The vein appeared normal up as far as a point where the facial vein was given off. From this point to the entrance of the vessel into the jugular foramen, the walls of the vein were very much thickened. The vessel was excised from a point just above the clavicle to a point just below the jugular fossa, all tributary vessels being divided between two ligatures. The upper portion of the vein was found to contain a soft, pulpy clot. The patient made a complete and uneventful recovery.

Discussion.—Dr. WHITING wished to know whether any suppurating process remained in the middle ear after the first operation.

Dr. DENCH replied that the ear had been practically dry.

Dr. GRUENING spoke of **late sinus infection.** A boy aged five had the grip. The ear became infected; paracentesis was performed. Mastoid tender. Other ear then became involved. Both mastoid processes were opened, both sinuses being exposed at operation. Temperature went down for two weeks, then went to 102°, 103°, and reached 105° on the third day. Both sinuses were incised. Temperature remained high. A swelling appeared in the groin. Evidences of pneumonia set in; respiration 50. The pneumonia took a rather prolonged course, and then the sternoclavicular joint was found involved. After this had disappeared, patient complained of pain on urination. An epididymitis was found present and subsequently also disappeared.

Discussion.—Dr. WHITING wished to know whether the incision made in the sinuses had been sufficient to obliterate them. He thought that this point was of great practical interest. Dr. GRUENING replied that the incision was repeated on the third day, and profuse hemorrhage again occurred, showing they had not become obliterated.

Dr. WHITING reported a case of **extensive pyæmic infection.** The patient had been treated for typhoid fever and had an old ear trouble. On approaching the patient, he was struck by the great odor. The patient had been suffering from septic diarrhœa, with a temperature varying between 99° and 107°, having regularly three to five very severe chills daily. The patient was semicomatose. The joints were painful, and there was infiltration along the anterior border of the sterno-mastoid and the internal jugular vein felt like a hard cord. Intense neuro-retinitis. Dr. Whiting reluctantly consented to operate, and found the mastoid process and sigmoid sinus completely disintegrated. The jugular vein down to the omo-hyoid was converted into an abscess cavity. Below this the vein contained pus. The origin of the sternomastoid was reflected and the junction of the jugular and innominate veins was exposed. A ligature was applied at this point; the innominate veins also contained pus. The patient died three days later.

Dr. HARRIS reported a case of **tubal occlusion.** This had followed an old ethmoiditis—which was about cured. There was no stricture or true stenosis. A medium-sized bougie enters middle ear without obstruction, and is always followed by loud inflation sound. Otherwise cauterization yields little response. Adrenalin applied to walls of canal has effect similar to bougie. Electrolysis and solution nitrate of silver proved unavailing.

Dr. KENEFICK asked whether scarification had been practised at the pharyngeal ostium of the tube. Dr. DENCH thought that the case was similar to one where he had believed that he had to deal with a fold of mucous membrane obstructing the tube, and that a bougie acted in overcoming the impediment.

Dr. Dench thought the case was similar to several which he had seen in which the pharyngeal orifice of the Eustachian tube was somewhat obstructed by folds of mucous membrane. In these cases, catheter inflation is difficult and sometimes impossible unless by gentle manipulation the instrument is crowded past the folds of mucous membrane. Under these circumstances we frequently find that by a little skilful manipulation a bougie will pass completely through the tube, although catheter inflation has been unsatisfactory or even impossible. Careful and skilful manipulation of the catheter will often make the diagnosis perfectly clear.

Dr. QUINLAN was of the opinion that the case was one of **vaso-motor congestion**—due to a **sympathetic stasis in the pharyngeal vault.** An application of 2 per cent. chloride of zinc, briskly rubbed so as to deplete these tissues, often gave immediate and permanent relief when repeated cauterizations failed to accomplish the purpose.

BOOK REVIEWS.

III. **Atlas and Epitome of Otology.** By GUSTAV BRÜHL, of Berlin, with the collaboration of Prof. A. POLITZER, of Vienna.

Authorized translation from the German, edited by Dr. S. MACEWEN SMITH, of Philadelphia, with 244 colored figures on 39 lithographic plates and 99 text illustrations. Philadelphia and London, 1902. W. B. Sanders & Co. Price $3 net. Cloth.

This is one of the series of medical hand-atlases which were written by competent men at the invitation of the Munich publisher, J. F. Lehmann, and translated into English by initiative of the enterprising Philadelphia publishing house of I. F. Saunders & Co., to whom English-speaking physicians owe a real debt of gratitude, for the reviewer knows of no series of medical text-books that is so excellent, and yet so moderate in price. It seems impossible that an atlas of so many colored or other illustrations could be published in German or English for $3, if the two firms did not arrange to divide the expense in some way. The greatest profit of such an arrangement is surely received by the physicians and their patients, who benefit most by this rapid exchange of every progress in the science and art of healing.

Otology now takes rank among the important branches of medicine, as it ought to, having to deal with one of the higher senses.

We know of no sort of publication more appropriate to learn its essentials from than this atlas, supplemented by a text-book, also profusely illustrated, 292 small 8vo pages, well printed on good paper. The reviewer begs to point out some of the plates, to give an idea of what they present. Plate viii. has four pictures of transparent temporal bones, the labyrinths injected with mercury. Such specimens were much admired at the last International Congress of Otology in London, three years ago. Plate x. has two very well executed and instructive illustrations of the mastoid and middle-ear spaces, as well as the cranial cavity; in the one picture with the dura removed, giving an admirable survey of the field, a thorough knowledge of which has now become so necessary. A very fine plate is No. xii., showing the application of the catheter in a transparent half-head, in which all the accessory cavities of the nose were injected with Wood's metal. Plate xxiv. presents good pictures of caries of the tegmen tympani, the perforation in the bone, and the small puckered fistula in the dura. Plate xxix. illustrates by six figures the usual methods of opening the mastoid, with Körner and Panse flaps. A good many plates are devoted to the pathology of the soft parts. The atlas occupies almost half the thickness of the work.

The **Epitome** describes, in text-book manner, the anatomy and physiology of the ear, the physical and functional examination, including bacteriological and histological examination.

	PAGES.
General pathology, treatment and general hygiene of the ear	146
Special pathology of the ear	147 to 275
Index	279

This book needs no recommendation. It speaks for itself.

H. K.

IV. **Die Berufskrankheiten des Ohres und der oberen Luftwege.** Von Dr. F. RÖPKE. Solingen, 1892. J. F. Bergmann, Wiesbaden.

This is the first attempt to describe the professional diseases of the ear and upper respiratory passages. The author, living in an industrial centre, has had ample opportunity of making many investigations which are of value not only to aurists but will serve to point out the necessary prophylactic measures. Dr. Röpke has studied the various industrial branches and has examined the mechanics at their place of work. The largest part of the book deals with the professional diseases occurring among those employed in mines, chemical factories, iron foundries, etc.; those peculiar to agriculturists, soldiers, and others leading an out-door life are also discussed. A complete review of the literature adds to the value of the book. A. HARTMANN.

V. **La surdi-mutité.** By Dr. SAINT-HILAIRE. Etienne, 1900. Maloine, Paris.

This most recent and exhaustive treatise on deaf-mutism deals with the etiology, pathology, symptomatology, diagnosis, prognosis, prophylaxis, and treatment. A statistical survey of the geographical distribution is given with special reference to the French Departments. Heredity, consanguinity of the parents, stigmata of degeneration, are fully treated. The presence of deafness without mutism in the relatives of deaf-mutes in ascending and collateral lineage is of extreme importance. 153 autopsy-reports are given. The clinical material of the author comprehends 187 deaf-mutes, inmates of the institute at Asnières near Paris. Hearing tests have verified Bezold's findings, and the author has also found the six Bezold groups. The tests were not made with Edelmann's instruments but with a series of König's tuning-forks and rods. As regards the possible development of hearing remnants, the author is an ardent supporter of Bezold's views, though he does not agree with the optimistic views of Urbantschitsch nor the pessimistic ones of Politzer. Due attention is paid to the voluminous literature of the subject. SCHWENDT.

VI. **Die otitischen Erkrankungen des Hirns, der Hirnhäute und der Blutleiter.** Von Professor O. KÖRNER, Rostock. Third edition, 1902. J. F. Bergmann, Wiesbaden.

Professor Körner's well-known monograph has appeared in a third edition. The book is enlarged and the subject-matter has been rewritten and brought up to date. The number of brain abscesses operated on has been increased from 92 (last edition) to 267, and sinus-thromboses operated on from 79 to 314. The chapters on serous meningitis and so-called osteo-phlebitic pyæmia have been rewritten, while chapters on the value of lumbar puncture and on operations in leptomeningitis have been added. It is one of the standard works in this field. A. K.

VII. **Some Thoughts on the Principles of Local Treatment in Diseases of the Upper Air Passages.** By Sir FELIX SEMON, M.A., F.R.C.P. London: Macmillan & Co., 1902. Price, 2/6 net.

Two lectures on the above subject by this eminent writer have now appeared in book form, and their increased accessibility will be welcomed by many. Beginning with a protest against operative intemperance, the author shows how the therapeutic advance due to increased accessibility of a part of the body to examination which was followed by a change from general to local treatment, is apt to be overshadowed by an exaggeration of the latter. To avoid this unfortunate tendency, certain guiding principles are brought forward in a discussion of a number of affections of the upper air passages. Among those of especial reference to otologists are the following. The question of operation in adenoids depends on whether they cause (*a*) permanent; (*b*) periodical and transitory; (*c*) no symptoms. In the first variety, the advisability of operating is acknowledged by all. In the second, the author advises to wait, unless an aural complication, glandular swelling in the neck, or a tuberculous family history be present. In the third, do not operate. If the operation is indicated, a strong plea is made to operate thoroughly under anæsthesia. We were very much interested to see that the author considers the dangers of lesser degrees of nasal insufficiency to the auditory function, and the influence of slight nasal abnormities (spurs, mucous swellings) on sclerotic middle-ear disease, to be grossly exaggerated. Conservatism in specialistic surgery has often been preached and still remains in order. This little volume will be read with interest by all and with profit by many. A. K.

EDITORIAL NOTICE.

The **Archives of Otology** is a bi-monthly journal, published in annual volumes of about six hundred pages each, extensively illustrated with cuts in the text, half-tone text plates, and lithographic plates, many in colors. About three-quarters of the space is devoted to original papers, and the remaining quarter to a systematic report on the progress of otology, and to reports of societies, book reviews, and miscellaneous notes. The papers and reports are original, and only accepted with the understanding that they are to be published in this journal exclusively. The original papers in the English edition appear in the German (*Zeitschrift für Ohrenheilkunde*) either in full or in more or less abridged translations, and *vice versa.* Any subscriber who wishes to refer to the original text of a translated or abridged paper may, by applying to the editor, obtain a reprint which he is expected to return after perusal.

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ARCHIVES OF OTOLOGY.

SUPPURATIONS IN THE LABYRINTH.

(*Concluded.*)

By Dr. VICTOR HINSBERG,

ASSISTANT AT THE POLICLINIC FOR EAR, NOSE, AND THROAT DISEASES IN BRESLAU.

Abridged and Translated by Dr. RICHARD JORDAN, New York.

5.—DIAGNOSIS.

LABYRINTHINE suppuration is easily diagnosed in cases where the typical symptoms, vertigo, deafness, nystagmus, nausea, and headache are well developed. The difficulty of proving unilateral deafness is known to be considerable, and the result of Weber's test is not always reliable. Another difficulty arises when the typical symptoms are present except deafness,—symptoms which may be due to a labyrinth suppuration confined to vestibule and semicircular canals or to a cerebellar abscess. The latter diagnosis would have to be supported by additional symptoms not found in uncomplicated otitis interna, as emaciation and prostration, mental changes, optic neuritis (in two thirds of all cases — Okada), slowness of pulse, etc. Cerebellar vertigo is more characterized by a staggering gait than by subjective dizziness, which difference, however, seems of little practical value. Extremely difficult is the diagnosis when labyrinth suppuration is combined with cerebellar abscess. As in the majority of cases the cerebellum is infected from the labyrinth, the combination of both affections is not uncommon. In one of our cases, which will be published elsewhere, the differentiation was impossible. In doubtful cases it is well to consider the fact that labyrinth suppuration is far more frequent than cerebellar abscess. The presence of an abscess will become more probable if no improvement should follow the elimination of the labyrinthine process. On the other hand, if the presence of a cerebellar abscess should be established, the exclusion of other causative complications, as sinus-thrombosis, would lead to the additional diagnosis of a suppuration in the labyrinth.

The absence of characteristic symptoms may prevent even the suspicion of a labyrinth complication. A suspicious symptom would be complete deafness developing under our observation in a case of otorrhœa. Dizziness is too vague a symptom and too common in aural diseases; it is also found in intracranial complications not accompanied by labyrinth suppurations. Marked vertigo, however, is a suspicious symptom, and it becomes very valuable when combined with nystagmus. While nystagmus does occur independently from aural lesions, its character and anamnestic data will aid us to properly estimate its diagnostic value.

The labyrinth suppuration may be disguised by the more conspicuous symptoms of a concurring intracranial inflammation; sometimes its existence may be deduced from the appearance of consequential meningeal symptoms (meningitis serosa). The uncertainty of the diagnosis in such cases will make an exploratory operation necessary, and the anatomical conditions thus revealed will frequently lead the way to the seat of the inflammation. We shall have to search for fistulous perforations on promontory or semicircular canals. It may be mentioned here that small cells on the prominence of the horizontal canal may resemble fistulous openings (*cf.* our Case 22), and also, that it may be difficult to say whether a fistula leads into the facial or into the semicircular canal. The region of the oval window has to be carefully examined. If it should be covered with granulations, a positive statement as to the condition of the stapes may be impossible.

In operations for extradural and cerebellar abscess, a search has to be made for communications existing between the abscess and the labyrinth. The seat of the perforation may point to the extension of the suppuration,— infection through the promontory or the oval window usually involving the whole labyrinth, infection through a fistula of the horizontal canal frequently remaining localized to the canal affected or to the vestibular cavities.

6.—PROGNOSIS AND TREATMENT.

From what has been said before, it is evident that we can never predict with certainty what course a suppuration of the labyrinth will take and how it will terminate. Spontaneous healing is not impossible; the suppuration may cease after a sequester has been exfoliated, or it may go on indefinitely without ever extending to the meninges. On the other hand, cases are quite frequent where the suppuration of the labyrinth suddenly leads to dangerous consequences, either without any apparent cause or owing to an acute exacerbation or to traumatic irritation. Inasmuch as we are unable to distinguish between favorable and dangerous forms, it would seem necessary to regard every suppuration of the labyrinth as a dangerous process, for the elimination of which we should use every possible means. Most important is the radical elimination of the destructive process in the middle ear, at the same time exposing and draining, if possible, the pathway of the infection into the labyrinth. In many cases this procedure will check and cure the inflammation in the labyrinth. In other cases the result of the operation may seem to be favorable, the wound healing up promptly; but the suppuration of the labyrinth may continue, and sooner or later meningitis may set in. Quite a number of cases have been reported where the mastoid operation was directly responsible for the extension of the infection into the cranial cavity.

It is a fact then that the effect of mastoid operations on suppurations of the labyrinth is rather doubtful; the realization of this fact has led to experiments tending to eliminate the process in the labyrinth itself, or to at least insure sufficient drainage of the affected cavities.

Jansen has first recommended and, to a certain extent, developed the operative treatment of labyrinth suppurations. In his article on "Deep Extradural Abscesses" (13), published in 1893, he advised to "open the vestibule in labyrinth suppurations accompanied by meningeal irritation." Five years later (11) he reported his observations in 10 cases of operations on the labyrinth. In 6 cases the vestibule was curetted through the oval window, or fistulæ on the semicircular canals were laid open and enlarged. In one case, where the horizontal canal and the roof of the vestibule had "been destroyed by cholesteatoma," the rest of the vestibule and the cochlea were opened up. No untoward results followed in any of these 7 cases. In 2 cases the vestibule was opened by "removing with the chisel part of the horizontal canal." One of the patients committed suicide before the labyrinth suppuration was cured; in the second case, meningitis followed the curetting of the vestibule, which was done eight days after the operation. In one case of extradural abscess, which had perforated the superior semicircular canal, the canal itself and the vestibule were opened from behind, the latter, however, "insufficiently." The symptoms disappeared promptly, but after four weeks meningitis set in, which terminated fatally. It was caused by the suppuration in the vestibule. Jansen reported two more cases of labyrinth operations in 1898 (24). In one case the vestibule was opened first, and later also the cochlea, which discharged pus, because the symptoms of meningeal irritation continued; in the second case only the vestibule was freely opened. Both patients recovered. Stacke (51) reports a case where he opened the labyrinth through the promontory, and makes a plea for operations on the diseased labyrinth. Other operations were reported by Manasse and Wintermantel (52) and Grunert (53). The records of 2 cases of the Rostock clinic were placed at my disposal by Professor Koerner:

CASE I.—Mrs. K., age forty, admitted December 4, 1899. O. m. p. c., A. D. Discharge had ceased for years until it started again about a year ago. For two weeks, pain in right ear and frontal headache; for two days, tinnitus and severe vertigo, with nausea. No vomiting.

Status.—Patient very pale, unable to walk, has sensation of falling toward the right. Temp. 99.0° F.

R. ear: Defect of membrane; tympanum filled with granulations; little pus. Weber lateralized toward left ear. Nystagmus (rotary-like movements).

Dec. 5th, Radical operation.—Mastoid sclerosed; discolored granulations in antrum. Fistula in anterior crus of horizontal canal is enlarged, first upward to the dura, then forward. The exposed cavity (ampulla?) contains granulations and is curetted. Wound left open. Nausea and nystagmus disappear promptly, vertigo gradually. On the eighth day, sudden rise of temperature to 100.6°, with nausea and occipital headache; then undisturbed recovery. March 24th, cavity epidermized.

CASE 2.—Fr. H., age twenty-five, admitted October 30, 1899. Recurrent otorrhœa and pain in right ear. Four days ago sudden vertigo and vomiting.

Status.—Patient well nourished, very pale, weak, not able to stand up or to walk; falls toward right. Subjective dizziness, vomiting, earache. Temp. 98.8°, P. 78. L. ear, normal; R. ear, large perforation; no granulations or cholesteatoma in tympanum, but some offensive pus. Weber toward left. No nystagmus. October 31st: Restless night; discharge thin, sanguinolent.

Radical operation.—Mastoid sclerosed. Cholesteatomatous matter in antrum, attic, atrium, and tubal orifice. Fistula above horizontal canal leads into small carious cavity, filled with granulations, and apparently communicating with vestibule. The cavity is laid open and curetted. Wound left open.

Nov. 1st.—Vertigo diminished. November 4th: Slight facial paresis. November 9th: Paresis little marked. November 17th: Closure of retroauricular wound. January 8, 1900: Facial paresis has disappeared. January 28th: wound epidermized. Function: Wh. 0 — 20 *cm.* (according to different numbers).

In another case from Koerner's clinic reported by Muck (54), an empyema of the endolymphatic sac was evacuated without opening the labyrinth, the sacculus having been infected directly from the diseased bone. Patient recovered.

The records of the Breslau Polyclinic (Professor Kümmel) contain the observations on a number of suppurations of the labyrinth, where the latter was opened intentionally.

CASE 13.—P. B., age thirteen. O. m. p. c., A. S., for three years after measles. Swelling behind the ear began two weeks ago.

Status.—Discharge of greenish pus; left canal filled with granulations; deafness; subperiosteal abscess.

Radical operation, June 20, 1898.—Large cholesteatoma. Sequestrum on promontory. After its removal, cochlea and vestibule are wide open. Fistula seems to lead into horizontal canal. Labyrinth is curetted; curette seems to reach the porus acust. int.; its withdrawal is followed by hemorrhage and free discharge of cerebro-spinal fluid. Complete facial paralysis. Liquor continues to flow for five days. Undisturbed recovery.

CASE 14. — E. D., age seventeen. O. m. p. c., A. D. Pain and dizziness for five weeks. When head is bent strongly forward or backward, patient falls forward toward left side. Closing of eyes does not increase vertigo. Nystagmus in extreme abduction and convergence of eyes. Right facial paresis. Deafness.

Sept. 4, 1897, *Radical operation.* — Granulations and pus in antrum. Fistula in posterior crus of horizontal canal; vestibule is easily opened, its lateral wall being partly necrosed. The opening is enlarged underneath the facial to the oval window. Recovery.

CASE 15. — R. M., age nineteen. O. m. p. c., A. U., for five years; lately dizzy when stooping.

Left ear: Large polyp in meatus, profuse discharge. Mastoid tender. Right ear: fetid discharge.

Aug. 26, 1899. — *Radical operation* on left ear. Large cholesteatoma. No complication. Primary suture.

Aug. 28th. — Suture infected; stitches are removed. After a few days facial paresis appears. Abundant granulations are cauterized with chromic acid.

Oct. 1st. — After cauterization sudden rise of temperature, severe earache, pain on pressure along jugular vein. Symptoms disappear with rest in bed.

Oct. 31st. — After use of probe severe attack of vertigo with nystagmus. Temperature to 100.8° on same day.

Second operation.—After removal of flabby granulations a fistula is seen on horizontal canal. Following its anterior crus the vestibule is opened. Granulations in both cavities. Cochlea is opened through promontory. Inferior convolution contains granulations. Curettement: Temperature normal after operation, nystagmus disappears promptly, vertigo marked for ten more days then subsided gradually. Recovery.

CASE 16. — B. M., age sixteen. O. m. p. c., A. U. Frequently dizzy during last few years; for five days severe vertigo, which makes walking difficult; headache.

Oct., 1899, *Status.*—Right ear, total defect of membrane, promontory partly covered with granulations, partly denuded. Deafness: Left ear, canal stenosed, fetid discharge. Conversation voice: 1.5 *m:* nystagmus when looking toward left.

Radical operation on right ear.—Granulations in antrum. Small fistula in horizontal canal. Canal and vestibule are opened, both contain granulations. Cochlea is opened through promontory and the opening enlarged to the oval window. The facial canal remains as a delicate osseous bridge. No discharge of cerebrospinal fluid. Vertigo increased after operation. On the second day nearly total deafness of *left* ear; hearing function returns after a few days. Nystagmus disappears quickly, dizziness gradually. Recovery. Right ear remains deaf, left ear hears conversation voice for 2 *m.*

CASE 17.—W. T., age forty-two, with pulmonary tuberculosis, O. m. p. c., A. D., for six years. Discharge increased six weeks ago. Some time later sudden dizziness and vomiting.

Status, *Nov.* 27, 1900.—Patient fairly well nourished; gait staggering; vertigo increased when eyes are closed; no distinct nystagmus. Right ear: large perforation in lower part, fistulous opening in upper part of membrane; deafness. Temperature 99.3°. Pulse 100. Left ear normal.

Radical operation.—Large cholesteatoma. Sinus exposed. Facial canal eroded. Fistula in horizontal canal is enlarged with burr, vestibule opened from the posterior crus. No cerebrospinal liquid escapes. Sinus accidentally injured with burr. Undisturbed recovery. Subjective dizziness disappears after two days, objective vertigo after many weeks.

CASE 18.—P. K., age fifteen. Chronic otorrhœa; no labyrinth symptoms; ear deaf; mastoid fistula.

Radical operation.—Cholesteatoma has eroded the horizontal semicircular canal; fistula is enlarged; posterior crus followed up into vestibule. Free discharge of cerebro-spinal fluid. After the operation severe vertigo for a week, then slowly subsiding. Recovery.

CASE 19.—E. K., age nineteen (extensive report will follow). O. m. p. c., A. D., for about four years, with occasional dizziness. No objective vertigo, no nystagmus. Function: wh. for 50 *cm.*

Oct. 1, 1900, *Radical operation.*—Mastoid sclerosed. Antrum small. No complication. Patient complains of severe dizziness; vomiting.

Oct. 6th. — Slight twitching on right side of face. Vertigo; nystagmus when eyes are turned toward left. During the following days, the symptoms of beginning meningitis appear. Rigidity of neck, fever, restlessness, irregular pulse. October 9th, fever.

Second operation is performed with the intention of eliminating the suppuration in the labyrinth. Manipulations difficult on account of abnormal position of sinus. Efforts to open the labyrinth from behind fail. Only posterior canal is opened; escape of liquor. No improvement. Death October 15th.

Autopsy.—Extensive meningitis; probable pathway of infection along sinus caroticus to cavernous sinus. Labyrinth infected through oval window; stapes dislocated inward, annular ligament destroyed, foot-plates intact. Exudation and infiltration in cochlea, vestibule, and canals.

Case 20. — E. G., age thirteen. O. m. p. c., A. S., lately dizziness. March 26, 1901: Pus in left ear-canal. Remnant of membrane with hammer. No nystagmus, no objective vertigo. Ear nearly deaf. March 28th: Incision of small furuncle in front of tragus. Patient does not call for several days, because of dizziness, headache, and fever. On April 2d his gait is somewhat staggering; complains of severe dizziness. Admitted for observation. Symptoms disappear during rest in bed. April 5th: Patient feels perfectly well and asks to be discharged. Suddenly after dinner (noon) severe headache sets in and vertigo; evening temp. 104.0°; drowsiness, slight rigidity of neck. Immediate *radical op.:* Mastoid sclerosed. Antrum large, contains pus. Oval window open, stapes missing. All symptoms improved temporarily. On April 7th another rise to 104.0°, and increased vertigo. Immediate *operation* on *labyrinth:* Vestibule opened with burr from ant. crus of horiz. canal. Cochlea opened from oval window. No discharge of cerebro-spinal fluid. Cochlea contains turbid serum; temporary improvement of subjective symptoms. Death from meningitis April 11th.

Autopsy.—Basilar meningitis; left acoustic nerve enveloped in pus. Micr. exam.—Facial nerve intact; vestibule empty; exudation and infiltration in cochlea; similar changes in semicircular canals. Round-cell infiltration of acoustic nerve and its branches.

In the following two cases the healthy labyrinth was opened on account of a diagnostic error:

CASE 21.— F. G., age sixty-three. Protracted acute suppuration of right middle ear. July 16, 1900: The antrum is opened and a *radical* operation performed on account of the extensive destruction. No complications. There were no labyrinth symptoms before the operation. The ear was rather deaf. On fifth day after the operation sudden rise of temp. to 104.4°, with severe dizziness, stupor, headache. Exploration of wound in narcosis; middle and posterior cranial fossæ opened. The result is negative and leads to the diagnosis — labyrinth suppuration. Vestibule opened from posterior crus of horiz. canal. No escape of cerebro-spinal liquid. Immediately after the operation severe dizziness and vertigo at the slightest movement. Temp. remains high. Two days later erysipelas appears on the face. Convalescence protracted by relapses of erysipelas, perichondritis of auricle, and extensive necrosis of corticalis. Recovery.

CASE 22. — C. K., age thirty-one. O. m. p. c., A. S., for four years. Radical operation proposed two years ago but refused. Discharge ceased for some time but reappeared six weeks ago, followed by headache, dizziness, fever, general weakness.

Status, *April* 27, 1901.—Left ear deaf. No nystagmus; fundus of eye normal; temp. 99.5°. Immediate *operation:* Large cholesteatoma in mastoid and antrum. Sinus exposed and covered with granulations. Apparent fistula on horiz. canal. As a labyrinth suppuration was probable, an effort was made to open the vestibule by following the fistula and the posterior crus of the horiz. canal. The effort is unsuccessful. Then the stapes is removed and the oval window enlarged with burr. Discharge of cerebro-spinal fluid. Severe vertigo after the operation. Further developments showed the case to be one of sinus-phlebitis. Patient died from pulmonary abscesses in spite of operation on the sinus with ligation of jugular vein. No meningitis. Microscopic examination later.

The number of operations on the labyrinth of which I was able to find a report is thirty-one and the *results* were the following:

The termination is not mentioned in 2 cases (one of Manasse's, one of Stacke's); 23 cases recovered, 6 died; of Jansen's cases one died from meningitis four weeks after the labyrinth operation; in one case meningitis followed the

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5.—DIAGNOSIS.

LABYRINTHINE suppuration is easily diagnosed in cases where the typical symptoms, vertigo, deafness, nystagmus, nausea, and headache are well developed. The difficulty of proving unilateral deafness is known to be considerable, and the result of Weber's test is not always reliable. Another difficulty arises when the typical symptoms are present except deafness,—symptoms which may be due to a labyrinth suppuration confined to vestibule and semicircular canals or to a cerebellar abscess. The latter diagnosis would have to be supported by additional symptoms not found in uncomplicated otitis interna, as emaciation and prostration, mental changes, optic neuritis (in two thirds of all cases — Okada), slowness of pulse, etc. Cerebellar vertigo is more characterized by a staggering gait than by subjective dizziness, which difference, however, seems of little practical value. Extremely difficult is the diagnosis when labyrinth suppuration is combined with cerebellar abscess. As in the majority of cases the cerebellum is infected from the labyrinth, the combination of both affections is not uncommon. In one of our cases, which will be published elsewhere, the differentiation was impossible. In doubtful cases it is well to consider the fact that labyrinth suppuration is far more frequent do not seem to cover the whole ground. Jansen does not answer the question when the cochlea should be opened. He opened it in one case with meningeal irritation which did not subside after the vestibule had been opened. Stacke opened it in one case, and we did so in three cases. It seems to be a fact that the cochlea is involved in nearly all cases of labyrinth suppuration requiring an operation. If the cochlea should be intact at the time of the vestibular operation, it is more than probable that it will become infected, or that at least its function will be destroyed by the cicatricial process. For these reasons, I would suggest that in all cases which call for an operation on the vestibule the cochlea should also be opened, in order to insure proper drainage and to prevent further infection. Another point is the difficulty of determining the seriousness of a diagnosed labyrinthine affection. We have seen that cases of an apparently serious character may heal up spontaneously, and, on the other hand, that cases with not at all severe symptoms may suddenly develop meningitis, sometimes after mastoid operations or without any provocation. The "severity of symptoms" as required in Jansen's indications is not always present in severe and serious cases. Whether these indications should not be extended must be decided by further observations.

TECHNIQUE OF THE OPERATION.

Easily accessible is the horizontal semicircular canal; by following its anterior or posterior crus, the vestibule can be opened. The posterior canal and the posterior crus of the superior canal are reached from the posterior surface of the pyramid, and can also be followed into the vestibule. The latter is opened anteriorly through the oval window, which can be enlarged by removing its inferior border. Of the cochlea only the inferior convolution is accessible through the promontory. Access will be difficult in cases where the carotid canal protrudes far into the tympanum, as shown by Koerner (55) and Gruber (56). The rest of the cochlea is not accessible, except in cases where its bony framework is destroyed. Jansen (60) reports that in such cases "it is easy to make a large opening below the facial and in front of the oval window, and to remove with burr and curette the contents of the cochlea, as pus, granulations, and carious particles. Injury to the carotid artery on the medial wall of the cochlea is surely avoidable. The fossa cribrosa should also be avoided." Which way we ought to choose for entering the labyrinth will depend on individual anatomical and pathological conditions. In cases complicated with extradural or cerebellar abscess, Jansen (57) recommends to expose both foci by "removing with narrow, straight chisel the posterior half or two thirds of the superior canal and, if necessary, part or all of the posterior canal; the vestibule is then opened from behind and the opening enlarged by removing the posterior crus of the horizontal canal." Under favorable conditions Jansen evacuated deep extradural abscesses through the median wall of the antrum and through the labyrinth. He recommends to enter the vestibule by way of the horizontal canal, behind the facial, and states that "little is gained by extraction of the stapes."

Examination of anatomical specimens shows that the vestibule may be reached either from the posterior or anterior crus of the horizontal canal, that posteriorly the wall is thicker than anteriorly, but that the anterior opening is in close proximity to the facial canal. The thinnest point of the vestibular wall is just above the oval window. In difficult cases the position of the vestibule can be ascertained by the introduction of a probe through the oval window, which is always easily located and easily invaded. It may be enlarged inferiorly to nearly twice its normal size, the vestibule thus being opened at its lowest point. The use of a suitable probe will aid us considerably in removing the rest of the vestibular wall above and behind the facial canal, which will remain as a thin bony bridge. The different steps of an operation on the labyrinth would be the following:

1. Radical operation. The posterior wall ("facial spur") is removed sufficiently to expose the region of the oval window.

2. Opening of foramen ovale and, if opening of cochlea is intended, removal of promontory.

3. Introduction of probe through oval window and, under its guidance, opening of the vestibule from the horizontal canal, if possible along its anterior crus, or, under difficult anatomical conditions, from behind.

The electric burr is preferable to the chisel, and a very fine burr should be used.

The use of the burr minimizes the injurious concussion; it facilitates the technique of the operation, and avoids the dropping of bony chips into the cavities of the labyrinth.

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A CASE OF PRIMARY ACUTE PURULENT INFLAMMATION OF THE MASTOID CELLS, INVOLVING NEITHER THE MIDDLE EAR NOR THE MASTOID ANTRUM.

By JOHN DUNN, M.D., Richmond, Va.

AS a rule, both empyema and osteitis with softening and destruction of the mastoid cells and process walls, are either coexistent with or directly secondary to demonstrable purulent conditions of both mastoid antrum and the middle-ear cavity. Although it is rare, primary purulent mastoiditis, differing in no way from the secondary affection save in the absence of symptoms directly referable to the antrum and middle ear, does occur.

Mr. W., aged nineteen, was brought to me February 5, 1902. History as follows: Two weeks previously he had taken a cold which "affected first the left side of my throat and then the right. As soon as it got in the right side the bone back of my ear began to ache and then the whole side of my head, and I have suffered terribly ever since." There had never been, so far as the patient knew, any previous ear trouble. Condition February 5th: Hearing for watch on the left side normal; on the right side four feet. Mucous membrane of nose, naso-pharynx, and pharynx normal. No excessive secretion. Drum membrane of the right ear showed no sign of inflammation, no reddening of the skin adjacent to or over Schrapnell's membrane, or over lower part of drum. The drum appeared abnormally pale, of a dead white color. The malleus handle could be seen only for its upper half; the lower half seemed buried out of sight in the dead white of the drum. Temperature 99½° F. Pulse 68 and irregular. The patient complained of great pain in the right side of his head. The pain was not confined to any one region. The mastoid was sensitive to pressure over its whole surface, especially over its posterior half and over the mastoid fossa. It was also painful for the patient to turn his head to the left — *i. e.*, to put the right sterno-mastoid on the stretch. There was no swelling over the mastoid. The diagnosis of mastoiditis was made and an immediate operation was advised. For reasons unnecessary to mention here, the operation was deferred until February 11th. On the morning of February 6th the drum membrane, whose appearance was the same as it had been the afternoon before, was widely opened. There followed no discharge from the middle ear (the incision bled freely for a few moments), nor did any discharge come from the middle ear during the succeeding days. The patient was put to bed and kept there three or four days, during which there was none of the old pain in the temporal region, no spontaneous pain in the mastoid save for half an hour or so once or twice. The patient's pulse continued slow and markedly irregular both in its character and in the number of beats per minute, intermitting irregularly and at short intervals. The mastoid continued sensitive under pressure, in places exceedingly so. The patient's temperature remained nearly continuously slightly above normal. His tongue, which on February 6th was normal, began to show stronger and stronger evidences of infection; his breath became offensive. There appeared, however, no swelling over the mastoid. The pain produced by stretching the right sterno-mastoid continued.

On February 11th **the mastoid was opened** and was found to be filled with pus, granulations, etc., with softened bone. The antrum, situated deep, was found healthy, so far as I could judge. It contained no pus. All of the patient's bad symptoms disappeared with the operation and the mastoid wound rapidly healed. That the Eustachian tube was patent was shown by the fact that for two or three days after the operation the patient's sputum was stained with blood.

The case is interesting as showing that the mastoid cells may become the seat of purulent osteitis with softening without the existence of a purulent condition of either the middle ear or antrum.

The infectious agent, probably that of the grippe, which had caused the transient sore throat, found its way into the Eustachian tube, into the middle ear, into the mastoid antrum, and thence into the cells, and found only in these latter, for some unknown reason, the resistance so much weakened that it was possible to cause a purulent inflammation resulting in osteitis of the cell walls. The peculiar appearance of the drum membrane was probably caused by inflammation in early childhood of which the patient had no recollection. It is not unlikely that at the same time the vitality of the mastoid was weakened, making thus a purulent inflammation possible without similar trouble in the antrum or middle ear. Dr. H. Knapp in his review of *Thérapeutique des Maladies de l'Oreille*, Lermoyez and Boulay, ARCH. OF OTOLOGY, vol. xxxi., p. 83, says: "Primary mastoiditis from influenza, etc., may occur, but is exceptional. The cases considered and described as primary mastoiditis are mostly such as originated in the naso-pharynx as usual, and affected the drum cavity lightly, but freely developed in the mastoid process."

A CONTRIBUTION TO THE PATHOLOGY AND DIAGNOSIS OF TUBERCULOUS OTITIS MEDIA.

BY G. K. GRIMMER, B.A. (CANADA); M.D., F.R.C.S., ED.,
ASSISTANT LARYNGOLOGIST AND RHINOLOGIST, MONTREAL GENERAL HOSPITAL.

(From the Laboratory of the Royal College of Physicians, Edinburgh.)

(*With Text-plate I.*)

CASES of suppurative otitis media, with possible, yet doubtful, tuberculous complication, were so frequently met with at the Royal Infirmary, Edinburgh, that it was obvious such cases offered an important field for observation, both with a view to determining a clearer clinical picture for distinguishing the tuberculous from the non-tuberculous, and also of ascertaining what methods of pathological and bacteriological investigation can be held to establish an indisputable diagnosis during life.

The following appeared to me to be the chief points to be investigated and studied in the endeavor to elucidate this question.

1. What light is thrown on the nature of the otitis by such symptoms as: the presence or absence of pain; bare bone felt through the external auditory meatus; destruction of bone about the middle ear; facial paralysis; perforation of the inner wall of the mastoid process (Bezold's perforation); enlarged glands over the mastoid process and in the neck; abscesses and sinuses in the same situations, and polypi in the external meatus?

2. What proportion of cases of suppurative otitis media, with bone lesion, are tuberculous (*a*) in children, (*b*) in adults; and at what age is the tuberculous form most frequent?

3. Do the naked eye and microscopic appearances of the pus, granulations, and diseased mucous membrane, from the middle ear (where such can be safely removed) afford any reliable evidence; and also, what information is to be derived from a similar investigation of naso-pharyngeal adenoids; of an enlarged mastoid gland, or other enlarged glands from near the diseased ear?

4. From what source and by what channel does the bacillus tuberculosis reach the tympanum, and what light is thrown on this point by microscopic examination — post-mortem — of sections of the Eustachian tube, the tympanic membrane (when sufficient has escaped destruction to permit of examination) and other neighboring parts?

5. What relation exists between tuberculous naso-pharyngeal adenoids and tuberculosis of the middle ear?

6. Is tuberculosis of the middle ear a primary or a secondary infection, or may it be either?

7. Does the discovery of tuberculosis in other organs give any reliable indication as to the nature of the ear disease?

8. How far may inoculation experiments on guinea-pigs, with products of the diseased middle ear, assist in the diagnosis of tuberculosis?

Lastly, I have studied the best methods of preparing, mounting, and staining microscopic specimens.

In considering the literature of tuberculosis of the middle ear, an endeavor has been made to give the present state of our knowledge — fully, yet briefly.

Von Tröltsch first pointed out that tuberculosis frequently occurred in the course of chronic otorrhœa, although the frequency with which chronic otorrhœa occurred in persons suffering from phthisis had been previously observed by several authors, *e. g.*, Romer, Grisolle, Nelaton, and others.

Only since the discovery of the bacillus tuberculosis by Koch, in 1882, has the pathology of this disease made any marked advance.

The first to demonstrate the tubercle bacillus in aural discharge was Eschle, in November, 1883. McBride and Gruber

ILLUSTRATING DR. GRIMMER'S PAPER ON TUBERCULOSIS OF THE MIDDLE EAR.

FIG. 1.—Tubercle bacilli, single, in V-shaped arrangement, and in clusters. From a section of naso-pharyngeal *adenoids*. Stained with carbol-fuchsin and discolored, but not counterstained. Photographed, $\frac{1}{18}$ oil immersion ; no eye-piece.

FIG. 2.—Tubercle bacilli from a *caseous patch of the mucous membrane of the tympanum*. $\frac{1}{18}$ oil immersion ; no eye-piece.

FIG. 3.—Four giant cells ; from section of *mastoid gland*. Stained with carbol-fuchsin, counterstained with methyl blue. $\frac{1}{4}$ lens ; no eye-piece.

FIG. 4.—Giant cell, with nuclei around its periphery and one tubercle bacillus in the right upper corner of cell ; from section of *mastoid gland*. Stained with carbol-fuchsin and methyl blue. $\frac{1}{18}$ oil immersion ; without an eye-piece.

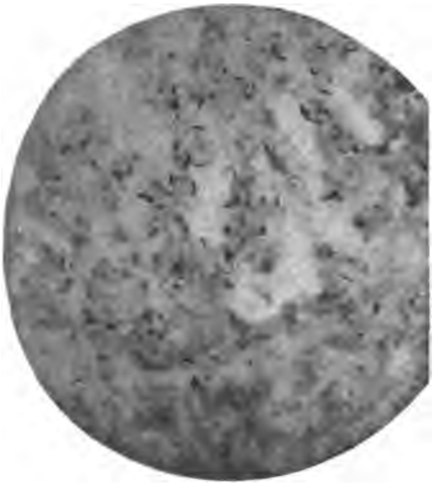

FIG. 1.

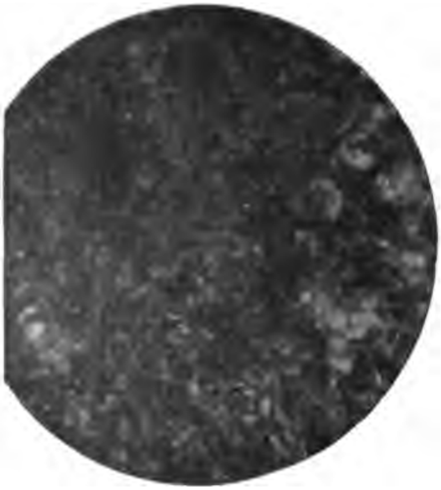

FIG. 2.

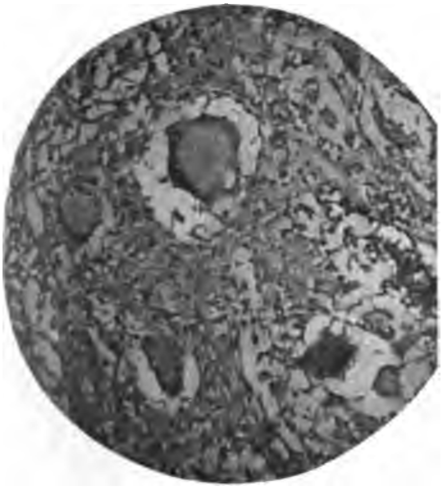

FIG. 3.

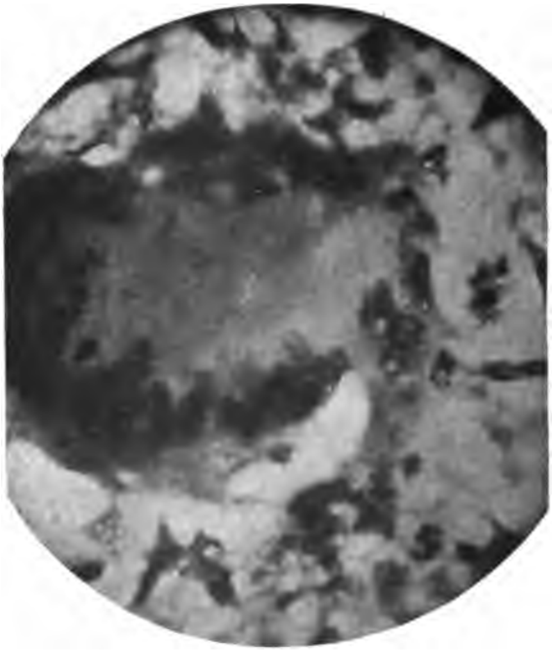

FIG. 4.

give to Voltolini the credit of this discovery, but give no dates; while Habermann would seem to have been first to demonstrate giant cells and tubercle bacilli in the mucous membrane of the middle ear in certain cases of phthisis (McBride).

The bacilli find their way into the tympanum in one of three ways: (1) by the Eustachian tube, mechanically, or by extension along its wall; (2) by the blood or lymphatic vessels; (3) through a previous perforation of the tympanic membrane. Milligan's statistics prove that this disease is frequent in children, and Brieger's, that there are more cases than clinical observations bring out. Brieger found that twenty-five per cent. of post-mortem cases, with tuberculosis, showed involvement of the ear, while Politzer, Scheibe, and Winkler maintain that the disease is most frequent in persons suffering from tuberculosis in other organs.

Among the chief predisposing causes which are mentioned by various authors are: phthisis; lupus and tuberculosis of the nose and other organs; hereditary tendency; unhealthy environment; unsuitable feeding; tuberculous relatives; and, in infants, tuberculous naso-pharyngeal adenoids; while as a cause Ostmann lays special stress upon the disappearance of fat from the lateral wall of the Eustachian tube in wasting disease, by making this tube more patent. Childhood is looked upon as a predisposing cause, since the Eustachian tube in children is shorter, straighter, and more patent than in the adult.

Tuberculosis of the ear may be a primary or secondary affection, most frequently the latter. There are differences of opinion as to the site at which the disease generally begins in the tympanum. Habermann, Winkler, and Brieger hold that it commences on the mucous membrane of the tympanum, especially near the promontory; Kuester, in the antrum; while Bernstein states that the membrana tympani may be first affected.

Tuberculosis of the ear may be acute or chronic. In the acute variety (which, Brieger says, is really tuberculosis plus mixed affection) there is a diffuse, cellular infiltration of the mucous membrane, with proliferation of the cells; giant cells are absent, but bacilli are numerous. The result is a rapid caseous disintegration of the mucous membrane. The bone is soon involved, and great destruction of it takes place, frequently with the formation of sequestra; while rapid granulation formation is also a feature of the acute variety. In the chronic form, circumscribed masses of miliary tubercle may be first seen on the superficial portion of the mucous membrane of the tympanum; these caseate, giant cells develop, bacilli are few, and the process gradually spreads deeper by ulceration. The spread of the process may be stayed, however, by fibrous-tissue formation cutting off its advance; but in most cases the bone becomes involved in a cario-necrosis, the disease finding its way into the labyrinth or mastoid process. Spread of this disease to the brain membranes is not very common, except in children, owing to fibrous-tissue formation closing the lymph spaces (Brieger).

Moos (S.), in his study of the pathology of chronic purulent myringitis in tuberculous individuals, found irregular hyperplasia in the Malpighian layer towards the cuticular layer. In the cuticular layer, the normal blood-vessels were enlarged; there were numerous new vessels and round cells, and new connective tissue; while in the mucous membrane of the membrana tympani there was hyperplasia, caused by the inflammation. In the substantia propria, he never found true vascular inflammation. In the handle of the malleus, he found carious processes on the outer surface, and increased thickening of the periosteum on the inner side.

Schwartze described small gray miliary tubercles on the inner wall of the tympanic cavity in children, the subject of tubercle, with purulent otitis, and visible as gray cheesy deposits.

"Tuberculosis of the middle ear is characterized by the long latency of its process and the absence of pain" (Brieger). Hartmann describes this disease as arising without definite symptoms. Politzer says: "In the majority of cases its presence is known by the subjective disturbances of hearing, and a slight discharge." With reference to the effect on hearing during the early stages, authorities differ.

Hartmann says there is impairment, while Dench claims that no impairment is noticeable. Moldenhauer only found impairment of hearing in 2.4 % of phthisical persons, while Brieger proved that 25 % of persons dying of phthisis show evidence of tuberculosis in the organs of hearing. Winkler considers the loss of hearing in one ear, bone-conduction remaining good, would point to tuberculous involvement in a tuberculous patient. He also says that in the later stages the disease has no distinctive symptoms to show, because it is then a mixed infection; Buck's opinion on this point is much the same.

Hovel says tubercles may be seen in the tympanic membrane before perforation, appearing as gray or minute reddish spots, and that when these break down perforations appear, perhaps several in number; the disease thus tends to rapid destruction of the membrane.

Multiple perforation, in the drum membrane, is a symptom recognized by all authorities as strongly pointing to a tuberculous origin.

Dench describes a tubercular perforation as follows: "It is usually circular, the edges thick and everted, and present, instead of the bright red color commonly observed in a simple perforation, a blue-white glossy œdematous appearance." Milligan describes the edges of these perforations as pale and indolent-looking.

Tuberculous ear discharge is described by Milligan as thin, profuse, purulent, and fœtid; by Winkler, as creamy, profuse, and at times blood-stained in the early stages; after mixed infection occurs, its character changes. The granulations are described by Milligan as flabby; by others, as pale and œdematous, frequently large, and filling the whole mastoid process, which has been hollowed out by them. There is frequently destruction of the mucous membrane of the tympanum and antrum, leaving the underlying bone bare, which can be felt with a probe (Politzer, Brieger).

Politzer says examination shows in recent cases a creamy secretion, a pale membrana tympani softened and perforated in the central portion or at the extreme periphery. Hartmann considers the lower half of the drum the typical place for these perforations to occur, while Buck thinks the upper posterior quadrant the most typical situation.

Roosa considers hemorrhage from the ear a frequent symptom in tuberculous suppuration of the middle ear.

Destruction of bone, often without external manifestation, is an important symptom, and this is often early and very extensive; consequently, facial paralysis is very liable to occur in this disease as an early symptom, owing to destruction of the wall of the Fallopian canal, while it is extremely rare in the early stages in non-tuberculous disease, owing to the bone not being early involved in this type of case.

In consequence of the hollowing out of the mastoid by tuberculous granulations, its cortical layer frequently gives way, causing an abscess to form behind the ear, which may burst and leave a sinus.

Haenel, who studied cases which had secondarily involved the inner ear, states that he only found six recorded cases up to 1896; while Brieger, in his paper (1899), says he has reported seven cases, and believes this complication is frequent.

The importance of finding tubercle bacilli in aural discharge is viewed differently by investigators. Many of them take this as an absolute proof of the existence of tuberculous changes in the ear. Gruber, Politzer, and Bernstein do not admit this, and Gottstein considers failure to find the tubercle bacillus in the ear discharge of small diagnostic importance, and quotes König and Marchand in support of this view; all are, however, agreed on the importance of searching for them in suspicious cases, and advise that the discharge for examination be taken direct from the tympanum. That it may be difficult or impossible to find the bacillus in an undoubted case is also a point agreed on by authors. Brieger recommends taking a piece of granulation for microscopic examination if possible, and gives a warning not to be deceived by the smegma bacillus; Siebenmann and Milligan advise inoculation of guinea-pigs as the best means of proving their presence. Brieger does not think well of this method, and says one may have to be satisfied with demonstrating characteristic tuberculous structure and degenerative processes in the tissues affected.

In making a diagnosis the majority of authorities agree that the following are the most important clinical indications: a painless onset of discharge from the ear; two or more perforations; the presence of pale œdematous granulations; a creamy pus discharge; facial paralysis coming on at a very early stage; while bare bone may be felt through the meatus. During an operation, the bone being found soft and cheesy and much destroyed by granulations is an important symptom. Before rupture of the membrane, tubercles may be seen on the drum, or, after rupture, on the tympanic wall. Notwithstanding the many guiding symptoms, cases occur in which a diagnosis from clinical symptoms is very difficult. Authorities agree that all cases of suppurative otitis in tuberculous persons are not always tuberculous. Percussion dulness over the mastoid is mentioned by Brieger as a symptom. Field thinks that where, in a case of suppurative middle-ear disease, in spite of free drainage, discharge continues, the disease may be looked upon as tuberculous; while Barr considers that caries of the mastoid associated with otorrhœa and enlarged glands in the neck, especially in children, indicates tuberculosis. In certain mild cases, Scheibe describes a thick, grayish, very adherent membrane, situated on the inner tympanic wall, as a positive indication of a tuberculous process.

The points in non-tuberculous otorrhœa which help to make a differential diagnosis are: that there is generally acute pain, associated with perforation of the tympanic membrane; that the inflammatory reaction is of a sthenic type; that there is much less destruction of bone, in the early stages at all events; that perforations are not pale and multiple, but red and single; that the internal ear is not so liable to become involved; and that facial paralysis early is very infrequent.

Scheibe asserts that otorrhœa associated with cholesteatoma is never tuberculous.

The prognosis, on the whole, is unfavorable, owing to the tendency of the disease to involve bone and to spread to other organs, but especially so if the case is already complicated by tuberculosis in other organs—*i. e.*, lungs. If the disease involve the ear only, recovery may take place under suitable treatment. As to retaining the hearing power in the affected ear, the prognosis is unfavorable.

Dench recommends in primary cases early removal of the focus of the disease; McBride states he never met with a case in which he considered this treatment advisable, but when caries and necrosis of the bone have occurred, he advises a radical operation, if the patient's general condition permits.

Milligan divides cases for treatment into: (1) Non-operable cases; such are infants with marked debility and emaciation; with advanced facial paralysis; masses of enlarged glands, and fœtid blood-stained discharge. (2) Operable cases; in these the general condition of the patient is good, and the main object should be to secure free drainage, by scraping away all diseased bone, and even exposing the dura and walls of the lateral sinus if necessary, in order to remove every trace of diseased tissue; then an attempt should be made to secure granulation of the cavity formed from the bottom. Enlarged glands in the neck should also be removed, while good nursing, fresh air, liberal diet, and tonics are agreed by all authorities to form an essential part of the treatment.

Milligan further says that when the ear has been destroyed as an organ of hearing, the antrum, tympanum, and mastoid cells should be thrown into one cavity, and this view is that which is generally accepted by authorities. Broca and Barbon think there is little danger of general tuberculosis following upon an operation for tuberculous middle-ear disease, and they believe that such ear disease can be cured, even when the patient has tuberculosis in other organs.

CASES.

Case 1.—Tuberculous purulent otitis media, left facial paralysis.

M. W., female, age five months; admitted Children's Hospital, Edinburgh, 22d December, 1900.

History.—In good health until six weeks ago, when a yellow pus discharge from the left ear, a cough, and twisting of the face to the right were noticed. Which of the three symptoms appeared first the mother is unable to say; but it would seem that each appeared about the same time. Since turning ill, infant has been frequently feverish; appetite and general health have gradually got worse, and for a few days there has been occasional vomiting.

A swelling was noticed behind the left ear shortly after the discharge commenced.

Family history.—None of tubercle.

Present condition.—A thin, pale infant. The anterior fontanelle is wide and slightly depressed. There is complete left facial paralysis; from the left ear there is a copious discharge of pus, thick, creamy, and fœtid, with a little blood occasionally. On pressure over the mastoid, pus wells up through the external auditory meatus. The posterior auricular glands, as well as those along the sterno-mastoid muscle are slightly enlarged, varying in size from that of a pea to a bean; there is occasional cough and slight diarrhœa.

Dec. 24th.—Slight holding back of the head and commencing retraction; vomiting has ceased. Slight tonic contraction of the right facial muscles noticed.

Dec. 27th.—Retraction of the head continues; pupils normal. There is a swelling, with fluctuation, over the left mastoid. Discharge continues free. A view of the deeper portions of the meatus cannot be obtained, owing to the swelling of the meatal wall. The right tympanic membrane looks normal.

Operation, Dec. 27th.—With usual incision behind left ear, an enlarged gland first came into view. (This gland was kept for future microscopic examination.) On dividing the periosteum a large empty abscess cavity was found, and the whole mastoid process and the posterior wall of the meatus were denuded of periosteum, and there was direct communication between the abscess cavity and the external auditory meatus, through its posterior wall.

While scraping out a superficial abscess, bleeding was noticed from the nose and mouth, showing that there must have been a large perforation, or complete absence of the tympanic membrane, allowing free passage of blood down the Eustachian tube. The bone over the mastoid antrum was not perforated, but very thin and exceedingly soft (caseous). No pus was found in the mastoid antrum; it was full of granulations. A very large cavity remained when the granulations and soft caseous bone had been scraped out. The ossicles came away with the granulations. The inner wall of the antrum and tympanum did not appear softened, feeling firm to probe touch. No sequestrum was found, and the dura was not exposed. The bridge of bone between the antrum and tympanum was very soft. The granulations were pale red and flabby, and showed numerous gray caseating points.

Some granulations and softened bone, from the antrum, were taken for inoculation experiments. Other granulations were placed in absolute alcohol for section cutting.

After-history.—The operation wound remained healthy and clean, and showed a feeble attempt at granulating. Without further symptoms of meningitis the infant gradually sank, and died on 10th January, two weeks after the operation. I made a post-mortem examination, of which the following is an epitomized report.

External inspection.—Emaciated female child. Operation wound behind the left ear shows only scant granulations. The occipital glands on the left side are enlarged to about the size of beans. The abdomen is tumid. The anterior fontanelle is wide and depressed.

Internal inspection.—The brain looked pale; but otherwise normal. The roof of the tegmen tympani on the left side was paler than that on the right. The pia mater at the base of the brain, in the circle of Willis, looked thickened; there were no visible tubercles along its vessels (a portion of it was removed for section cutting). A portion of the squamous, the whole of the mastoid, and the petrous portions of the temporal bones and the Eustachian tubes on each side were removed for minute examination. Some adenoid tissue from the naso-pharynx was also removed. The lateral ventricles were of normal size and contained no fluid. Cerebellum normal.

The abdomen showed marked tubercular peritonitis, with numerous nodules, and the lungs typical miliary tubercular infiltration.

Left temporal bone.—On removing the dura mater the tegmen tympani was found very thin, but not perforated. The operation cavity was covered with frail, pale granulations. On removing the soft parts the inner tympanic wall was found somewhat destroyed, but the inner ear was not invaded. About the antrum the destruction of the bone was extensive. The bone surrounding the carotid canal was eroded, but the artery was not laid bare. The foot-plate of the stapes was present. The bony wall of the Eustachian tube had become involved. The outer wall of the Fallopian aqueduct was gone at the downward bend, and the facial nerve could not be found.

Right temporal bone.—Its tympanic membrane looked smooth and normal on the external surface. When the mastoid antrum and tympanum were laid open by the saw, the mucous membrane was found much thickened and studded with small elevated gray points, each about the size of a pin-head. Tubercles were also numerous on the inner wall of the tympanic membrane and on the mucous membrane of the Eustachian tube. The underlying bone was not much, if at all, involved in the disease. The thickened mucosa almost filled the cavities of the antrum and tympanum. No changes could be noted in the inner ear.

CASE 2.—**Tuberculous purulent otitis media — both ears.**

M. McI., female, age seven years six months. Admitted Children's Hospital, Edinburgh, Sept. 14, 1900.

Family history.—Highly tuberculous on father's side only.

Previous history.—Healthy at birth ; teething late, tenth month ; speaking also late, second year. She had pneumonia in her fourth year and has never had good health since.

Present illness.—The discharge from ears commenced about twelve months ago ; the hearing got suddenly bad about three weeks before the discharge commenced,— previously it was good. She complained of some intermittent pain about the time the hearing became impaired ; three days before the discharge appeared, pain became continuous and very distressing, entirely preventing sleep. Pain was not complained of after the onset of the discharge, which was at first thin, afterwards thick, yellow, and more offensive, and has been continuous since its commencement. The onset was simultaneous in both ears.

Since the primary pain there has been little or none until three weeks ago, when the ears again became painful.

Sept. 25th.—Right mastoid antrum was opened and scraped out, but the granulations were not kept for examination.

Oct. 3d.—There is a foul-smelling, thick, yellow discharge from the left ear. No swelling or redness behind this ear. The tympanic membrane appears to be entirely gone, and bare bone can be felt through the meatus.

Operation on the left ear. — The usual incision was made and the mastoid exposed; no sinus or bare bone was found, but the bone covering the mastoid antrum was very thin — a mere shell. The granulations in the antrum could be seen shining through the bone and looked bluish. The antrum was found filled with granulations, but contained very little pus. The bone surrounding the granulations was soft and easily scraped away. (The granulations, which were large and rather pale, without visible caseous points, and scrapings of bone were taken for inoculation and microscopic examination.)

A point noticed in this case was the large size of the mastoid antrum, and the considerable distance it extended backwards without reaching the lateral sinus.

After-history. — Granulation in both ear wounds was slow, and that in the right temporal bone remained unhealthy, and required a second operation, Nov. 29th.

Jan. 30, 1901.—The left mastoid wound is now an open cavity; looked healthy, and nearly covered with epithelium. The right was still a granulating surface. I have not been able to follow the history further.

CASE 3.—**Tuberculous otitis media of the left ear, with left facial paralysis.**

A. H., female, æt. three. Admitted Royal Infirmary, Edinburgh, Oct. 18, 1900.

History.—When three months old, a discharge commenced from the left ear, apparently without pain.

Shortly after, the face was noticed to be twisted to the right side. Once or twice glandular abscesses have formed and been opened behind this ear and also at the back of the neck. Polypi are said to have been removed on two occasions. The right ear has occasionally discharged, but hearing has been good.

Family history.—Nothing to note.

Present condition. — There is a fœtid discharge from the left ear of thick yellow pus, and a sinus opening below this ear, the skin above it being undermined and of a strumous appearance. Bare bone is felt through the sinus, and the left external auditory meatus is found completely blocked with a sequestrum bathed in pus, and within half an inch of the surface.

Operation, Oct. 21st. — A cavity was found, containing a sequestrum, at the lower portion of the mastoid process. On removing the sequestrum with forceps, it was found to consist of one large piece, about the size of a hazel-nut, and several smaller pieces. The sinus was found leading to the cavity containing the sequestrum; after the sequestrum was removed, numerous granulations were found surrounding it and lining the cavity. The sequestra were dark red, as were the granulations sticking to them; but the granulations lining the cavity in which they were lying were paler red and rather flabby. The sequestra were at some points hard and firm, at others soft and cheesy. (The sequestra were taken for microscopic examination, and the granulations for inoculation. An enlarged gland, found over the mastoid, was also taken for examination.)

After-history. — The granulating process was slow and the wound required frequent stimulation.

Jan. 15th.—The facial paralysis remains unaltered; the wounds are still unhealed, but are showing signs of closing. Her general health has greatly improved since coming into hospital. There is now practically no discharge from the meatus.

CASE 4.—**Tuberculous otitis media of the left ear; with transient left facial paralysis.**

E. E. M., female, æt. five months. Admitted Private Home, Edinburgh, May 21, 1900.

History. — When ten weeks old, a bad smell from her left ear was noticed, but was never marked; there was facial paralysis for three weeks, which has entirely passed off.

Family history.—None of tubercle.

Present condition. — There is a thick, foul-smelling, abundant discharge from the left ear and a sinus behind it. Not much tenderness about the ear. Notwithstanding the presence of a sinus, distinct fluctuation is felt over the mastoid. In the neck, there are a few enlarged glands. In the right ear there is some impacted secretion. Syringing brought some cheesy material from the left ear, but the tympanic membrane could not be seen.

Operation, May 22d. — The usual incision opened an abscess cavity containing about one ounce of pus. The periosteum was stripped from the mastoid, but no sinus was found in it; there was, however, but a thin shell of bone over the mastoid antrum, which was filled with granulations and pus. The granulations were rather dark red and not œdematous. The communication between the tympanum and the antrum was free. The ossicles were not removed. Granulations from the mastoid antrum were taken for inoculation.

After-history.—Made a good recovery.

Case 5. — **Tuberculous otitis media of the right ear, with hollowing out of the mastoid and Bezold's perforation.**

D. P., male, aged eight months. Admitted Private Home, Edinburgh, May 22, 1900.

History. — The right ear has been discharging for four or five months; two large abscesses in the neck on the right side have burst and left sinuses.

Present condition. — There is a foul-smelling discharge of thick yellow pus from the middle ear, and there are several sinuses in the neck below the mastoid process, and over the sterno-mastoid muscle, evidently arising from suppurating glands. Several glands along the posterior border of the right sterno-mastoid and also the suboccipital glands on the same side are enlarged. Pressure when applied below the left ear or over the mastoid behind it causes pus to well up freely from the external meatus. There is a perforation on the anterior meatal wall at its lower part, and through this pus appears on applying pressure as before mentioned. Nothing more can be made out by examination of the meatus. There are a number of flabby œdematous granulations about the orifices of the sinuses, and the skin has a markedly strumous appearance. There is a perforation of the tympanic membrane on the left side.

Operation, May 23d. — These sinuses were cut into one, and on removing a very thin plate of bone the antrum was entered and found to be full of granulations and pus. The whole of the mastoid process seemed hollowed out by the granulations, and there was a perforation on its inner wall near the tip. The dura mater was exposed at the upper part of the cavity, the pulsations of the brain being distinctly communicated to the blood lying at this part.

The granulations were large, flabby, and rather pale; several of these were taken for inoculation; patient made good recovery.

Case 6 — **Chronic suppurative otitis media of the right ear, with right facial paralysis.**

H. G., female, aged four years. Admitted Royal Infirmary, Edinburgh, Oct. 16, 1900.

History. — The right ear began to discharge two years ago, shortly after measles and scarlet fever. Twelve months ago she had what her father calls a shock; was unconscious for an hour or more, and when she regained consciousness it was noticed that her face was twisted to the left side. At this time considerable pain was complained of in the region of the ear, and a swelling appeared at the angle of the right jaw. The discharge has been continuous and free ever since, and the facial paralysis has remained unaltered. Patient was able to run about up to the day of admission to hospital.

Present condition. — There is well marked left facial paralysis, not quite total, and from the right ear a free discharge of fœtid yellow pus. On probing bare bone was felt.

Oct. 17th. — Since coming to hospital the temperature has ranged between 97° and 98.4°. Pulse varies, last night 100, this morning 144. The respiration 20 last night, 30 to-day. The patient is very restless, takes nourishment with great difficulty, and has vomited several times this morning, the vomit being a greenish mucus. She tends to be somewhat drowsy, but cries if moved. There is neither swelling nor tenderness in the right mastoid region.

Examination of the ear. — The right ear is full of very fœtid pus, which up till this morning has been coming away freely, but less so during the last hour or two. The probe touches bare bone in the midst of the pus and close to the orifice of the external meatus. Nothing beyond this can be seen, as the meatus is found blocked by a sequestrum which can be moved by a probe.

Operation, Oct. 17th. — The usual incision was made for exploring the mastoid antrum. The periosteum was removed, and a thin layer of bone taken from over the lower portion of the mastoid process. This portion of the process was found full of granulations and the sequestrum felt anteriorly. A portion of the posterior meatal wall was removed to expose the sequestrum more thoroughly. The cartilaginous portion of the meatus was then divided sufficiently to allow a free communication between the mastoid wound and the external meatus. The sequestrum was removed through the combined openings posteriorly. The cavity left was found lined with granulation tissue. The ossicles were not seen.

In removing the sequestrum it was broken into three pieces, the largest being of the size and shape of the terminal phalanx of the little finger. These were each of a firm bony consistence, but had a worm-eaten appearance, and presented a number of hard sharp edges. No cheesy or caseous bone was found in any part of them. The granulations around them were large and red, and showed no caseous points. Some granulations were taken for inoculation; the sequestrum was kept for examination, and cover-glass films made from bits of the granulations.

After-history, Oct. 18th. — The patient remains in much the same condition as before the operation; there is frequent vomiting. The temperature varies from 97° to normal; the pulse 150. The wound looked very dry; no reaction. Evening: temperature 100°; pulse 160; respiration 40.

Oct. 19th. — She is semi-conscious, lies with her arms stretched out and knees drawn up, not easily roused, but occasionally exhibits great restlessness. Has now developed diarrhœa, the motions being passed unconsciously. She bores her head into the pillow and keeps it retracted, but does not seem specially sensitive to movements of the head. Nothing can be detected in the lungs, but there is a slight cough; pulse, 160; temperature, 99°; respiration, 38. No sweating, no cyanosis, no muscular twitchings, no retraction of abdomen. There is occasional grinding of the teeth and a tendency to collapse.

Second operation, 4.30 P.M., *Oct. 19th.* — The symptoms pointing to brain complications, a trephine was applied to the skull about half an inch above the right external auditory meatus, but nothing was found. The dura was stitched up and the wound closed. She never regained consciousness and died the following morning.

The following is an epitome of the Pathologist's report:

Body well nourished; well developed child

Thorax.— Lungs somewhat congested, no pneumonia, no tubercles, other organs healthy.

Abdomen. — Peritoneum healthy, mesenteric glands enlarged. Liver and kidneys each of uniform pale color from anæmia and extensive fatty changes.

Brain. — No meningitis, vertical or basal; cerebral sinuses healthy; on section, the gray matter of the entire encephalon showed intense congestion, but no other lesion.

Naked-eye examination of right temporal bone. — After removing the dura mater from the roof of the right tympanum, a perforation was found twice the size of a pin's head; this led directly into the cavity in which the sequestrum lay. The walls of the mastoid antrum were not involved in the destruction of bone, but practically the whole of the inner ear, cochlea, bony labyrinth, and semicircular canals had been separated in the sequestrum, and are easily made out in it.

CASE 7.—**Chronic suppurative otitis media of the left ear with left facial paralysis.**

A. R. (female), aged four years. Admitted to Royal Infirmary, Edinburgh, Nov. 1, 1900.

History. — Shortly after birth abscesses formed behind the left ear; these were opened and soon after similar abscesses formed in front of the ear. About the same time the left ear began to discharge, and the discharge has continued ever since. Facial paralysis was noticed soon after the discharge commenced, and has gradually increased in degree.

Family history. — None of tubercle.

Present condition. — There is complete left facial paralysis, a free, foul-smelling discharge of thick yellow pus from the left ear, and a suppurating sinus over the lower portion of the mastoid process on same side, with pouting, pale, pinkish, flabby granulations around it. Bare bone is felt within the sinus, and a large freely movable sequestrum in the external auditory meatus.

Operation, Nov. 4th. — The sequestrum was readily removed through the meatus and found to be about the size of the thumb nail, but rather thicker. The sequestrum was of hard consistence, uneven and rough on the surface, with no caseous points. After the sequestrum had been removed this cavity was found to be lined with granulations. When these had been removed, it became evident that the whole of the posterior meatal wall as well as the lower wall and a portion of the mastoid process were gone, the cavity communicating freely with both the mastoid wound and the external auditory meatus.

In the position of the anterior bony wall of the meatus, the parts felt soft, as if it had disappeared also. No caseous bone was discovered, and the granulations within the cavity were different from those, previously described, around the sinus, as they were darker in color and not so flabby and œdematous.

After-history. — Seven weeks after operation, the sinuses were healed and the operation wound nearly covered with epithelium.

Case 8.—**Chronic suppurative otitis media, left facial paralysis.**

W. C. (male), aged thirty years. Admitted to Royal Infirmary, Edinburgh, April 28, 1900.

History. — For thirteen years the left ear has discharged. Four years ago it became worse than usual, and continued so for two years, when he came to the Infirmary for treatment. At this time he had a polypus removed; it returned and was again removed four weeks ago. During the last two years he has syringed and attended to his ear intermittently, and for the last month regularly. Two weeks ago he had some granulations in the left meatus cauterized, and soon after pain in the ear became much worse. On April 27th left facial paralysis was noticed; the ear pain was very intense, and localized to the mastoid region.

Operation, April 29th. — The usual mastoid incision was made. The cortical layer of bone over the antrum was found much sclerosed. In the antrum numerous dark-red granulations were found, but no pus; some of them were taken for inoculation. The posterior meatal wall was removed.

After-history. — Uneventful; the facial paralysis disappeared in a few days, and the wound closed by granulation in about three weeks.

Case 9.—**Suppurative otitis media; probably tuberculous.**

A. T. (male), age seven years. Out-patient, Eye, Ear, and Throat Infirmary, Edinburgh.

History, March 15, 1900. — Has been suffering from phthisis for some months. Through the night, four days ago, a discharge commenced from the right ear, without pain.

Family history. — Tuberculous on his mother's side.

Present condition. — There is a thin, yellow, purulent discharge from the right ear. This, on being wiped away, revealed a pale, sodden-looking tympanic membrane, with a small perforation at the posterior inferior quadrant. The edges of the perforation are pale and swollen, but without evidence of acute inflammatory reaction. Pressure over the mastoid process causes slight pain; the tonsils are slightly enlarged. Some pus was taken on a sterile swab, from the deeper portion of the meatus, for inoculation.

Case 10.—**Chronic suppurative otitis media, complicating pulmonary and laryngeal phthisis.**

R. H. (male), aged thirty-five years. An out-patient at Royal Infirmary, Edinburgh.

History. — Patient's history was not taken on his first visit, and as he did not return it could not be obtained.

Present condition, March 20, 1900.—Both ears show perforations fairly clean cut, the remaining tympanic membrane is white, and on the inner wall there is a gray deposit.

After syringing. — The membrane is seen to be somewhat thickened, and the deposit on the inner wall remained in both ears even after drying. Both perforations are much bigger than they appeared before syringing. The probe detects bare bone on the inner tympanic wall on both sides.

A scraping was taken from the right middle ear with a sharp spoon for inoculation purposes.

CASE 11.—**Right suppurative otitis media, with acute mastoiditis.**

W. McK. (male), age thirty-nine years; brewery man. Admitted to Royal Infirmary, Edinburgh, March 20, 1900.

History. — Nine weeks ago the right ear commenced to discharge, without pain. The discharge is very profuse and of a pale yellow color; it does not appear to have been bad-smelling at the commencement, but soon became so. Eight days after the discharge appeared, severe pain commenced in the ear, but was easier at intervals, following a freer discharge. Two weeks ago the discharge became less, and a swelling appeared over the right mastoid process, extending to the temporal region. There has been a throbbing sensation in the ear almost from the first appearance of the discharge.

Of late years, cuts or scratches have healed badly, but patient says he has always enjoyed good health, excepting fifteen years ago when he had pneumonia.

Family history. — Tuberculosis on his mother's side.

Present condition. — Patient looks flabby and unhealthy. There is an acute inflammatory condition in the right mastoid region, extending above the level of the auricle, fluctuating at the centre, hard and indurated around its periphery.

The posterior and upper wall of the meatus are bulging, rendering a view of the deeper parts difficult, but a perforation and some granulations can be made out in the posterior portion of the tympanic membrane.

Operation, March 22d. — The usual mastoid incision opened at once into an abscess cavity lined with granulations, from which there was a copious flow of thick yellow pus. The mastoid was denuded of periosteum and looked unhealthy; on removing a very thin plate of bone a cavity was entered, filled with pus and granulation tissue, occupying nearly the whole of the mastoid process.

Some of the granulations were taken for inoculation, others for section cutting.

After-history. — Uneventful; made a good recovery.

Case 12.—**Chronic suppurative otitis media of the left ear with a mastoid sinus.**

G. C. (male), aged eleven years. Admitted to Royal Infirmary, Edinburgh, March 3, 1900.

History. — Some years ago, following acute pain in the left ear, a discharge commenced which has been constant since. Occasionally there have been attacks of pain in the ear followed by a more profuse discharge. About a month ago a swelling formed behind the left ear, broke, discharging pus, and leaving a sinus. Two weeks later, on March 4, 1900, a large firm polypus was removed from the ear by means of a snare. This polypus was kept for microscopic examination.

Present condition, March 10th.—There is a foul-smelling discharge from the left external auditory meatus. Probes passed in by the sinus and meatus cannot be made to touch one another; bare bone can be felt on the floor of the meatus, on the floor of the tympanum, and on the posterior wall of the tympanum.

Operation, March 10th. — The usual incision was made behind the ear, and a radical operation done. Numerous granulations were found in the sinus and in the mastoid antrum. Some granulations were taken from each situation for inoculation.

Case 13.—**Left chronic purulent otitis media, with cholesteatoma of the mastoid antrum, followed by acute mastoiditis, with Bezold's perforation.**

G. D. (male), aged twenty-four years. Admitted to the Eye, Ear, and Throat Infirmary, March 12, 1900.

History.—Since childhood, and following measles, there has been a discharge from the left ear, which has been continuous, but more abundant at some times than at others; syringing with boracic lotion has been carried out fairly regularly. For the last six months he has suffered a good deal of pain at intervals. Three weeks ago a polypus was removed from the ear; ten days ago a swelling commenced to form behind this ear, associated with pain, which has been continuous and severe.

Family history.—None of tubercle.

Present condition.—There is swelling and redness over the left mastoid region, and for about three inches down the neck. No fluctuation. There is a little discharge from the ear of thick, curdy, very foul-smelling pus. The meatus is very narrow. All that can be seen is the stump of the polypus recently removed.

Patient has not slept for two days in consequence of severe pain in ear.

Operation, March 14th.—The usual incision for exploring the mastoid was made. The antrum was reached after removing about half an inch of very dense hard bone. In it were found cholesteatomatous masses bathed in curdy pus. When these, and some granulation tissue which was also present at the lower portion of the mastoid process, had been removed, pressure in the neck caused pus to flow into the cavity thus formed, and the probe revealed a perforation on the inner wall of the process near its tip.

An abscess was found beneath the sterno-mastoid muscle which communicated freely with the mastoid wound. The following specimens were taken: pus from mastoid antrum; granulations from the mastoid cells and abscess cavity.

After-history.—The patient made a good recovery, the intense pain being immediately relieved by the operation. The mastoid wound healed by granulation from the bottom in four weeks, as did the neck wound.

Seven months later, the facial paralysis had been completely recovered from; there was still a slight discharge, but no pain had been suffered since the operation.

CASE 14.—**Right acute purulent otitis media, followed by acute mastoiditis with Bezold's perforation.**

A. M. (male), aged twenty-one years; admitted to Royal Infirmary, Edinburgh, Nov. 27, 1900.

History.—Had scarlet fever without complications at twelve years, otherwise has had good health until seven weeks ago, when he says he was seized with influenza, and severe sore throat. Four days after the initial seizure, both tonsils are said to have burst, a discharge of pus coming from each. The same night he felt pain in right ear, which continued four days, then a discharge appeared and the pain ceased. On three occasions blood was noticed in the discharge during the syringing of the ear.

Four days after discharge commenced, pain returned, and the tissues behind the ear began to swell.

Family history.—No tubercle.

Present condition.—The left pupil is larger than the right, but this, patient states, is the result of previous disease in the eye; the optic discs show nothing abnormal. The right ear stands out markedly from the side of the head, and there is a fluctuating swelling behind it. The skin over the mastoid is red and the tissues are infiltrated over an area the size of the palm of the hand. There is a very profuse discharge of thick yellow pus from meatus. Tympanic membrane cannot be seen owing to rapidity with which pus returns after being cleared away. Pressure over the mastoid increases the rapidity with which the pus returns. Urine shows specific gravity 1.025, no sugar, some albumen, and a trace of blood. There is no desquamation on any part of the body.

Operation, November 28, 1900.—The usual incision down to the bone. This opened an abscess cavity. On removing a very thin layer of bone, granulations were met with, occupying the antrum and the mastoid cells. The granulations were large and numerous, of the œdematous, flabby type, and presented no caseating points; they were red, not pale; they were scraped out, leaving a very large cavity in the bone. A perforation was discovered on the inner wall of the mastoid process, close to its tip.

The bone around the granulations was soft, and showed evidence of rapid destruction, but was not caseous.

Several films were made from pus in abscess cavity, from pus in the antrum, and from an emulsion made from the granulations. Some of the granulations were taken in the usual way for inoculation, and a culture was made on blood serum.

History.—Patient made a rapid and perfect recovery. One month after the operation the wound was healed, the meatus dry, and the hearing good.

CASE 15.—**Left acute mastoiditis with Bezold's perforation following chronic suppurative otitis media.**

Mr. C., age eighteen years; admitted to Private Home, Edinburgh, Nov. 10, 1900.

History.—Has had an intermittent inoffensive discharge from left ear since childhood. Six or eight weeks ago when mountain climbing in the Highlands he caught a cold; this was followed by a more profuse discharge from the ear. Ten days later a swelling commenced behind the left ear. Syringing was done and powdered boracic acid was blown into the meatus. There was slight improvement for a time, but a week ago the discharge entirely ceased, accompanied by discomfort in the ear and intermittent pain.

Present condition. — There is now no discharge from the ear, and a small perforation is seen in the upper posterior quadrant of the membrana tympani with pouting, pale, and œdematous edges which are of a coral color. There is a large, non-fluctuating, painful, tender swelling, red, brawny, and indurated, over left mastoid process, extending towards the neck, downwards and backwards. No pus can be made to escape from the perforation in the drum membrane, by pressure on the swelling. The left ear stands out from the head much more than the right.

Operation, Nov. 11th.—The antrum was reached after removing about a quarter of an inch of softened bone. It was found filled with granulations; a specimen was secured for inoculation and microscopic examination. A perforation of the inner wall of the mastoid process near its tip was discovered with a probe; with pressure on the neck below, pus welled up into the wound. A counter opening was made in the neck; the posterior wall of the meatus and the tympanic cavity were not interfered with. The granulations were dark red, not flabby nor caseating.

After-history.—The patient made a complete and uneventful recovery.

CASE 16.—**Chronic suppurative otitis media of right ear, with mastoiditis and cholesteatomatous masses.**

C. S., male, aged six years. Admitted to Royal Infirmary, Edinburgh, Nov. 9, 1900.

History.—When a few months old he had an attack of acute inflammation in the right middle ear, accompanied by pain. The existence of severe pain is demonstrated by the history. A discharge was noticed after a few days, and has been continued to the present time. There is no history of measles or other acute disease. Attacks of pain have occurred in the ear from time to time; occasionally also pain was complained of behind the ear.

Since the discharge commenced, treatment has been regular.

About three weeks ago severe pain commenced in the affected ear, with a painful swelling over the mastoid region, which soon became red. During the last few days the pain, swelling, and redness have been less marked.

Family history.—None of tubercle.

Present condition, Nov. 10*th.*—There is a copious foul-smelling discharge from the right ear, but no pain is complained of. After syringing, the posterior wall of the meatus is seen to be bulging into it in the form of a cone. From the apex of the cone pus is escaping, and into it a small probe can be passed and bare bone felt. It is impossible to get a good view of the tympanic membrane, on account of this projection of the meatal wall. The parts about the mastoid are tender to touch, but there is now very little swelling and no redness.

Operation, Nov. 11*th.*—The usual mastoid incision was made, and the bony external auditory meatus exposed. The tympanic membrane was found to be entirely gone.

The mastoid antrum, when opened by Stacke's method, was found of large size, and contained cholesteatomatous masses and granulations. (Some of the latter were taken for inoculation.)

The granulations were red and of medium size.

After-history.—Two months later ear still discharging.

CASE 17.—**Chronic suppurative otitis media of left ear.**

L. F., female, aged three years and ten months. Admitted to Royal Infirmary, Edinburgh, Dec. 18, 1900.

History.—When one year and nine months old, after three days' severe pain in the left ear, a discharge of thick yellow pus commenced, and has continued the same ever since. As soon as discharge appeared, the pain ceased. Never had measles or scarlet fever; a few months ago had whooping-cough, from which she made a good recovery.

Treatment has been regular ever since the commencement of the disease. Every few months there have been periods of pain, associated with retention of discharge. About three weeks ago she had an unusual attack of this kind, and the family doctor stated that he found her temperature 100.2°. On this occasion also the discharge was absent, but reappeared in two days with subsidence of pain. During the last six months she has disliked having her head touched in any way, as it seemed to cause pain.

Family history.—None of tubercle.

Present condition.—Pale, ill-nourished child. There is a thick discharge of yellow fœtid pus, which is sometimes rather watery; there is no swelling over the mastoid region on the left side, nor any standing out of the left ear. No enlarged glands can be felt in the neck. There is a small perforation at the lower posterior quadrant of the tympanic membrane. This membrane is dull grayish-white, thick, and sodden-looking; no granulations are seen. There is some bulging and reddening of the posterior meatal wall; the discharge is very free.

Operation, Dec. 23d.—Mastoid antrum opened; contained nothing abnormal. Lotion was syringed in by the wound, and came out by the meatus.

I was unable to obtain anything for inoculation or examination. (On several occasions previous to the operation I stained films of pus, taken from the surface of the drum at the perforation.)

After-history.—The mastoid wound healed fairly rapidly, but discharge continued from the left ear. On January 8, 1900, the right ear commenced discharging. A month later there was still a very slight discharge from both ears.

CASE 18.—**Right chronic suppurative otitis media, with acute mastoiditis.**

A. R., male, aged eight and a half years. Admitted to Royal Infirmary, Edinburgh, Jan. 16, 1901.

History.—Has had an intermittent chronic discharge from the right ear since two years old, following measles. Nasal-pharyngeal adenoids were removed at three years. Left ear has discharged occasionally. A week ago a swelling rapidly appeared behind the right ear, which was larger then than at present; there was a little pain the first day only. Discharge from the right ear has come on about every four to eight weeks and has lasted about one week. Attacks of this kind have been recurring since the first onset.

Family history.—No tubercle.

Present condition, Jan. 19th.—Right external meatus contains a quantity of foul-smelling, thick, yellow pus, which, when syringed away, shows a tympanic membrane of purplish color, with some whitish-gray flakes upon it. There is distinct pulsation just in front of the umbo, revealing the position of the perforation. There is no bulging of the posterior upper wall of the meatus. Behind the right ear, over the mastoid, there is a large fluctuating swelling, rather larger than a five-shilling piece, painful only when touched. No head symptoms.

The abscess over mastoid was opened by Wilde's incision, and about half an ounce of pus escaped.

Operation, Jan. 20th.—The previous incision was enlarged, the mastoid exposed; no suprameatal spine being present the external auditory meatus was taken as the guide. The gouge was applied half an inch behind its upper margin, in the meatal triangle. When bone to the depth of about half an inch had been removed in this position pulsation was noticed, and the wall of the lateral sinus was found exposed, its anterior edge being within half an inch of the external auditory meatus. The mastoid antrum had been opened at the same time; a few granulations were found in it and were taken for microscopic examination, as well as a gland from over the mastoid process.

After-history.—Patient made a good recovery.

CASE 19.—**Left acute suppurative otitis media followed by acute mastoiditis.**

Mrs. W., aged forty-seven. Admitted to Royal Infirmary, Edinburgh, Jan. 13, 1901.

History. — Hearing has been impaired since an attack of measles in childhood, but she has not had any other trouble with her ears until ten days ago, when she was attacked with sudden pain in her left ear, following a cold in the head. The pain continued for two or three days, when something burst in her ear, and immediately afterwards a red discharge came from it. The onset of discharge did not result in relief of the pain, but the position of the pain changed from the ear to behind it, extending upwards over the head, and downwards into the neck. A thick yellow pus discharged has been continuous and profuse since its onset. No rigors or vomiting.

Family history. — None of tubercle.

Present condition. — Has a flabby alcoholic appearance. The temperature normal. Pulse 75, weak, and compressible. There is marked pain and tenderness over the region described; also a profuse discharge. After syringing, immediate inspection shows a congested, bulging membrane, with a large perforation situated in the anterior inferior quadrant, with thick œdematous edges, from which pus wells up quickly; no bulging of the meatal wall, but slight fulness over the mastoid process and region generally.

The left auricle does not stand out more prominently than the right.

The patient can hear a slightly raised conversational tone in the affected ear at a distance of about one inch. Watch only heard on contact. Urine normal.

Operation, Jan. 31st. — The mastoid periosteum was very adherent. On chiselling away one quarter of an inch of cortical layer of bone, the mastoid cells were reached and found filled with granulations; no large antrum cavity was found, but the aditus was determined and a probe passed into it. The posterior meatal wall was not in any way interfered with. (Some granulations from the mastoid cells were reserved for inoculation, and others for section cutting.)

After-history. — Recovery progressed favorably for a week after the operation. I was unable to follow the history further.

METHODS OF INVESTIGATION.

Inoculation Methods.

Villimen in 1865 first described subcutaneous inoculation of animals for the detection of tubercle, and Delépine's experiments have proved the guinea-pig the most suitable animal. Cohnheim and Solomonsen in 1877 devised the plan of inoculation into the anterior chamber of rabbits and got good results. Many competent observers hold that the most reliable proofs for tubercle can be obtained by inoculation—*e. g.*, Arloing, Leloir, Verneuil, Milligan.

In carrying out my experiments, I have adopted the intraperitoneal method of inoculation, as usually carried out at the Laboratory of the Royal College of Physicians, Edinburgh, slightly modified, in preference to the subcutaneous method of Delépine. All instruments and utensils used were sterilized, and the most careful antiseptic precautions taken throughout all the experiments.

The tissues for examination, which consisted of granulations and scrapings of bone from the most actively spreading portions of the disease, were pounded in a mortar with a little sterile normal salt solution, and the more liquid portion was injected with a syringe into the peritoneal cavity of a guinea-pig.

Two healthy guinea-pigs were usually taken for each experiment, the second being used as a control.

The guinea-pigs inoculated from the same case were always kept by themselves in one cage; their weights were taken at the time of the inoculation and again at intervals of a week or ten days, until they died or were killed after a period of five or six weeks.

At the post-mortem dissection of the guinea-pigs, the seat of inoculation was observed, as well as the peritoneum and all the abdominal organs; their naked-eye appearances carefully noted, while all, or at least some portion, of the following organs and tissues were taken for microscopic examination, viz.: the great omentum, a mesenteric gland, if enlarged, the spleen, a piece of liver, and a kidney. If any part of abnormal appearance was observed, that portion, especially, was secured for further examination. The thorax was then opened, and its glands and organs examined and dealt with as in the abdomen. On a few occasions, blood-serum tubes were inoculated and cover-glass films made from tuberculous nodules.

Preparation of specimens for cutting.—This was done in one of the three following methods: 1st. Corrosive-paraffin method. 2d. Absolute alcohol-paraffin method. 3d. Formaline-paraffin method, and cut with a Cambridge rocking microtome.

I used egg albumen prepared as follows, for fixing my sections to the slide: To 10 *ccm.* white of egg 100 *ccm.* of distilled and sterilized water were added, and the two shaken thoroughly together, then filtered into a bottle, and 10 *ccm.* of absolute alcohol added and thoroughly shaken and kept tightly corked.

The chief advantages I found in the egg albumen, prepared as I have described, were: 1st. It was not so sticky and dirty as that prepared with glycerine, yet quite sufficiently adhesive to hold any specimen perfectly to a slide, including tissue fixed in formaline. 2d. That it kept perfectly for months, and was always ready for use, thus being superior to egg albumen and distilled water alone (Mann's method[1]), which has to be made fresh as required.

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[1] Muir and Ritchie, *Manual of Bacteriology*, page 102.

Methods of staining: A.— For sections fixed by corrosive and absolute-alcohol methods, this was done by the ordinary Ziehl-Neelsen method with filtered carbol-fuchsin for twenty-four hours in cold stain, or for one hour in same stain in an incubator at 35° C., decolorized with twenty-five per cent. sulphuric acid, and then in methylated spirit for five or ten minutes; counter stained with methylene blue, dehydrated with absolute alcohol, cleared in zylol, and mounted in balsam, with No. 1 cover slip; for films the same stain was used by the ordinary watch-glass and heat method.

B.—For sections fixed in formaline a modification of the above method was found necessary.

The organs from four guinea-pigs, which showed marked naked-eye tuberculous infiltration, were fixed in Joel's fluid — a preservative containing formaline. When the sections prepared in this way came to be stained by the ordinary carbol-fuchsin method, it was found that they took the stain badly; only a few bacilli took the stain, and although the character of the tissue could be made out to be tuberculous, its definition was cloudy and indistinct; in fact, in many of the sections bacilli could not be demonstrated at all by this method; yet from the microscopic appearance of the tissue one felt certain that they must be present. (The chief laboratory assistant and other experienced stainers also stained sections, with exactly the same result as my own.) Consequently I came to the conclusion that the formaline in which the tissue was fixed must in some way be interfering with the action of the stain. In discussing my difficulty with Dr. Noël Paton, he suggested that the imperfect staining might be due to formic acid, and advised soaking the sections in some alkaline solution before staining; consequently, after removing the paraffin in the usual way, I placed the sections in solutions of liquor ammoniæ and liquor sodæ with methylated spirit. After many experiments, the best results were found to be attained by putting the sections for fifteen to twenty minutes in a solution of liq. ammoniæ, 1 in 40 of methylated spirit; after the above treatment, the time required did not exceed five minutes for decolorization, which was done in the ordinary way. By this modification of the carbol-fuchsin method, these formaline fixed sections could be perfectly stained and made to show distinctly the structure of the tissue, the caseous nodules, the tubercle bacilli, and epitheloid cells. In some of the sections, which by the ordinary method showed no bacilli, or only a few, this method showed them to be present in great numbers.

C.—For tissue elements the staining was done by the ordinary hæmatoxylin and eosin method.

The microscopic examination of specimens.—This was done with one-fourth, one-sixth, and one-twelfth (oil immersion) lenses, a mechanical stage being used.

Microscopic and Inoculation Experiment Reports.

CASE I.—M. W. The left mastoid gland and the granulations from the left mastoid antrum, removed at the operation, Dec. 27, 1900, were prepared for section cutting by the absolute-alcohol method, and the sections stained by staining method A (as were all specimens in this case).

Sections of the gland show numerous caseating areas in various degrees of advancement, a few giant cells, numerous epitheloid cells, and tubercle bacilli. The bacilli are most numerous in the more advanced caseating areas; here the bacilli have mostly the beaded appearance.

The bacilli in and about the epitheloid cells are less numerous, and do not present the beaded or spored appearance, being stained throughout their whole length. In several microscopic fields, with a one-twelfth inch oil immersion lens, between twenty and thirty bacilli were counted. Some portions of this gland present the normal lymphoid appearance, with no epitheloid cells or bacilli.

The granulations above mentioned were pale and flabby, and caseous-looking points were visible in them. The caseating foci were very distinctly seen during the process of rubbing up, in sterilized salt solution, in preparation for inoculation into the guinea-pig, the residue in the mortar having an appearance closely resembling grated cheese. Microscopic sections of these granulations show much the same appearance as that seen in the gland just described, there being caseating areas, epitheloid cells, and tubercle bacilli, but no giant cells. In one field more than sixty of these bacilli were counted, and, as in the last specimen, they are most numerous in the caseating areas, where most of them show the beaded appearance.

An emulsion was made of some of the granulations and centrifuged ; films made from the deposit and stained for tubercle failed to give a positive result.

Sections of the adenoid tissue removed from the naso-pharynx and stained for tubercle show numerous advanced caseating areas, and around them epitheloid cells. In some of these nodules tubercle bacilli are seen in great number ; more than a hundred were counted in one one-twelfth inch microscopic field. Some of them are single rods, stained throughout ; others have the spored appearance ; several have the V-shape arrangement ; and a few look as if they were branched.

The mucous membrane removed from the mastoid antrum and tympanum of the right ear, when cut and stained, shows microscopically numerous caseating areas in various stages of advancement, around which are many epitheloid cells. Tubercle bacilli are also present.

Sections from the right tympanic membrane (which on its external surface looked normal, and on its mucous surface showed thickening and pale nodules) are found microscopically to disclose the following characteristics : Its whole stratum mucosum is infiltrated with the tuberculous process, and tubercle bacilli are present in considerable number, especially towards its tympanic surface. No giant cells are present. The mucosa is much thickened, and the caseous degeneration extends throughout its whole substance. The fibrous membrana propria is very largely unaffected, although the mucosa in immediate contact with it is in an advanced stage of tuberculous degeneration ; at a few points, however, it has been partially destroyed by the disease and has almost disappeared, while here and there throughout its substance a tubercle bacillus is seen in what otherwise looks normal tissue. At the parts of the membrana propria where destruction has taken place, the appearance is that of erosion and not of infiltration. The cuticular layer is more extensively involved than the membrana propria. It shows a considerable number of tubercle bacilli in various parts, and a few epitheloid cells, showing that the disease was commencing to make rapid progress there. The condition of the membrana propria shows that its fibrous structure offers a stubborn resistance to the spread of the disease to the cuticular layer. Sections from the anterior mediastinal gland, as well as those from the lung and a mesenteric gland, show caseating nodules, epitheloid cells, and bacilli; in those of the great omentum a few giant cells are seen as well. Glands near the right and left Eustachian tubes and a gland from under the sternomastoid show tuberculous infiltration, caseation, epitheloid cells, and bacilli in great number. Sections of the left Eustachian tube, at different levels, show the whole mucous membrane and the submucous layer of adenoid tissue beneath it infiltrated with tubercle. In fact, nearly all the adenoid tissue normally present in children in this situation has been replaced by granulation tissue, which in many parts has undergone tuberculous degeneration.

The tissues around the submucous adenoid layer are only slightly infiltrated at their junction with the latter. Bacilli are seen in considerable number throughout the submucous layer, but not beyond it. In a gland shown in the same section, and about ¼ of an inch from the Eustachian tube, advanced caseation and bacilli in great numbers are found. In one microscopic field, between three and four hundred bacilli were counted, but they were so numerous that it was impossible to count them accurately. The tissue between the submucosa and this gland shows no sign of tuberculous involvement. A gland situated near the right Eustachian tube shows a very similar appearance to the corresponding one on the left side. The cartilage around the left tube, the muscular and fatty tissues, and the mucous glands situated in the immediate neighborhood have not been attacked.

Sections from the pia mater and from the left temporo-sphenoidal lobe of the brain, immediately over the tympanic roof in the middle cranial fossa, show no evidence of tubercular involvement, neither does the tissue from the pharyngeal wall in the immediate neighborhood of the adenoid tissue which has been previously described as showing advanced tuberculous change.

Hæmatoxylin- and eosin-stained sections of the right Eustachian tube and carotid artery in the bony portion of the canal show the mucosa of the Eustachian tube much thinner and less involved than in the cartilaginous portion of the left tube. The adventitia of the right carotid is much thickened, but otherwise unaltered.

Granulations from the mastoid antrum were prepared and inoculated on Dec. 27, 1900, into guinea-pig No. 25: weight then

712 grms., on Jan. 21, 1901, 675 grms., and on Jan. 29, 1901, 530 grms. On this date it was killed and on dissection showed general tuberculosis. There was a caseous nodule at the seat of inoculation.

Microscopic sections, of the spleen and great omentum, show caseating areas, epitheloid cells, and tubercle bacilli.

CASE 2.—M. McI. Granulations, including some bone tissue from the left mastoid, were prepared and inoculated into guinea-pig No. 17 on Oct. 4, 1900, its weight then being 610 grms. On Nov. 15th, it weighed 460 grms. (*i. e.*, 42 days after inoculation); it was then killed and dissected, and showed a caseous nodule at the site of inoculation, and general tuberculosis.

Films were made from caseous nodules in the spleen, great omentum, and site of inoculation, but none of them show tubercle bacilli. The spleen, great omentum, and a lumbar gland were prepared for section cutting by the absolute-alcohol method. The sections chosen for staining (method A) were those passing through a nodule; they all show typical tuberculosis, caseous degeneration, epitheloid cells, and tubercle bacilli, but no giant cells. Two films were also prepared from a piece of granulation from the mastoid, and stained, but show no tubercle bacilli.

CASE 3.—A. H. Granulations were taken from the wall of the cavity in which the sequestrum was found, on Oct. 21, 1900. They were prepared as usual, and inoculated into guinea-pig No. 20, Oct. 2d, which then weighed 528 grms. It died on Nov. 23d (31 days after inoculation), its weight being 392 grms. Typical tuberculous nodules were found in several organs. Sections prepared from the spleen and the lumbar gland, stained for tubercle (method A), show numerous caseous nodules, degenerative changes, epitheloid cells, and tubercle bacilli, but no giant cells.

One film from a nodule in the spleen, at the time of dissection, shows tubercle bacilli. None were found in several other films examined.

CASE 4.—E. E. M. The granulations and a scraping of bone, taken from the mastoid antrum on May 22, 1900, were prepared and inoculated into guinea-pigs Nos. 13 and 14, by the usual method on May 25th. (The delay in making the inoculations in this case and the next, was owing to the impossibility of obtaining guinea-pigs sooner.)

At the time of the inoculations, the guinea-pigs weighed 527 and 490 grms., respectively; on June 3d, 502 and 470 grms. On July 10th, No. 13 died; it then weighed 330 grms. On dissection it showed general tuberculosis. The whole guinea-pig was placed in Joel's fluid.

On July 13th, No. 14 was killed; it then weighed 343 grms. It showed general tuberculosis also. This guinea-pig was also placed in Joel's fluid. After allowing these guinea-pigs to remain in this fluid for two weeks, the liver, spleen, and the great omentum were taken from each and prepared for staining by methods A and B.

Sections of the above stained by staining method A did not take the stain well, and although they show numerous caseating nodules and badly stained epitheloid cells, only a few imperfectly stained bacilli were seen in a few of the sections. By soaking similar sections in 1 in 40 liquor ammoniæ before staining, as previously described under "Methods" (staining method B), the tissues were much better stained, numerous bacilli were demonstrated having all the typical characteristics of tubercle bacilli.

CASE 5.—D. P. Granulations and bone scraping were taken from the mastoid antrum, and also granulations from the walls of the suppurating cavity in the neck, on May 23, 1900.

The solution prepared from the former was inoculated into guinea-pig No. 15, and that from the latter into guinea-pig No. 16, on May 25th; No. 15 then weighed 492 grms., and No. 16, 542 grms.; on June 3d, they weighed, respectively, 480 and 562 grms. No. 15 died on July 13th; it then weighed 322 grms. On the same day — that is, nine weeks after the inoculation,—No. 16 was killed, its weight being 360 grms.

Both these guinea-pigs showed general tuberculosis. These guinea-pigs were put into Joel's fluid, and two weeks later the great omentum, spleen, a piece of liver, and other affected parts were prepared for section cutting by Method 3.

Sections of those organs when stained by staining method A, show exactly the same imperfect results as the sections from the guinea-pigs Nos. 13 and 14, similarly stained, but when treated with ammonia solution, by staining method B, they showed tuberculous degeneration, caseation, epitheloid cells, and tubercle bacilli in the most typical manner.

Guinea-pigs Nos. 13, 14, 15, and 16 had each a large caseous nodule at the site of inoculation, on the seventeenth day.

CASE 6.—H. G. The granulations from the cavity in which the sequestrum was lodged were prepared and inoculated into guinea-pigs Nos. 18 and 19, Oct. 17, 1900. On Nov. 27th, No. 19 died, and on Nov. 28th, No. 18 died.

On dissection, no naked-eye evidence of tubercle was found in either. In microscopic sections of the spleen and great omentum no degenerative changes could be found.

At the post-mortem examination of the body of H. G., an enlarged mesenteric gland was taken and prepared for cutting (corrosive method). Microscopic sections show no degenerative changes, or other evidence of tubercle.

A portion of the right temporal bone, including a portion of the wall of the cavity, in which the sequestrum was situated, and with the granulation tissue on its surface, was placed in Pereny's fluid to decalcify. Microscopic sections, prepared and stained for tissue elements and tubercle, show nothing indicating tuberculous degenerative changes.

CASE 7.—A. R. Granulations, from the walls of the cavity in the temporal bone, from which the sequestrum was removed on Nov. 4, 1900, were prepared and inoculated into guinea-pig No. 21, on Nov. 5th ; weight 488 grms. On Nov. 27th it died ; weight 494 grms. On dissection, it showed no tubercle. Microscopic sections of the spleen and great omentum, stained for tubercle by staining method A, show no evidence of tubercle. Several films of the pus from the right external auditory meatus, taken on Nov. 14th and stained for bacilli, also showed none. A small gland removed on Dec. 22d from near the diseased ear showed degenerative changes in places and also a considerable number of cells exactly like epitheloid cells, but no giant cells or bacilli.

CASE 8.—W. C. The granulations removed from the mastoid April 29, 1900, were prepared and inoculated into guinea-pig No. 12 on April 30th; it then weighed 580 grms.; on May 10th, 594 grms; on May 20th, 605 grms.; on June 19th, 650 grms. On this date it was killed and its organs and glands were found normal.

CASE 9.—A. T. Pus was taken on a sterile swab from the surface of the right tympanic membrane, mixed with some sterile salt solution in a sterile dish, and inoculated into guinea-pig No. 4 on March 15th. Weight at the time of inoculation 620 grms; on March 19th, 622 grms. On the 29th it died—that is, thirty-one days after inoculation. The dissection showed no evidence of tubercle, and the microscopic inspection of section from spleen showed no degenerative changes.

CASE 10.—R. H. The scraping which was taken from the tympanum was prepared and inoculated into guinea-pig No. 5 on March 20, 1900, its weight then being 597 grms.; on April 2d it weighed 422 grms., and on the 8th of April it died, and that is nineteen days after inoculation. It showed no evidence of tubercle in any part.

CASE 11.—W. McK. A solution was prepared from the granulations from the mastoid and inoculated into guinea-pig No. 6 on March 21, 1900. The guinea-pig then weighed 574 grms.; on April 2d it weighed 444 grms.; on April 27th it died and was dissected; no evidence of tubercle was found. Microscopic sections of the spleen show no degenerative changes. Granulations from the mastoid show ordinary granulation tissue, and in a few places some large cells, but no caseation of bacilli.

CASE 12.—G. C. Granulations from the mastoid were inoculated into guinea-pig No. 1 on March 12, 1900. The guinea-pig then weighed 670 grms., and on March 19th, 640 grms.; on March 22d, 628 grms.; April 2d, 547 grms.; on May 17th, 515 grms.; and on the same day it was killed and dissected. Organs found normal. Granulations from the abscess cavity over the mastoid were prepared and inoculated into guinea-pig No. 2 on March 12th, which then weighed 752 grms.; on March 16th, 647 grms.; March 19th, 727 grms.; March 22d, 693 grms.; and April 2d, 547 grms. This guinea-pig died on April 7th, twenty-six days after the inoculation. Dissection revealed no naked-eye evidence of tubercle. The spleen and great omentum of both show no tuberculous changes in their structure microscopically.

Sections of the aural polypus removed from the patient show it to consist chiefly of granulation tissue, without degenerative changes.

CASE 13.—G. D. The granulations removed from the mastoid were prepared and inoculated in guinea-pig No. 3 on March 15, 1900, weight 717 grms.; on March 19th, 737 grms.; on March 29th, 760 grms.; and on April 16th, 780 grms. It was killed on the last date. No naked-eye evidence of tubercle was found. Microscopic sections from the liver and spleen show no degenerative changes.

A streak culture was made on agar-agar of pus from mastoid antrum; after twenty-four hours a whitish culture was found, which on microscopic examination proved to consist of small narrow bacilli and streptococci. The bacilli were quickly decolorized by acid.

Some antrum granulations showed microscopically ordinary granulation tissue without degenerative change or bacilli. Several films of pus from the external ear showed numerous small bacilli and various kinds of cocci, but no tubercle bacilli.

Case 14.—A. M. Films of pus from external auditory meatus show cocci in chains and groups. During the operation, films of pus were taken from mastoid antrum; they show cocci in chains and groups, but no tubercle bacilli. Some granulations from antrum were prepared and inoculated into guinea-pig No. 24. Films from granulation solution showed nothing but cocci in chains and groups, as did the pus films.

No. 24 guinea-pig was inoculated on Nov. 29, 1900; it then weighed 282 grms.; on Dec. 8th, 260 grms. It died on Dec. 18th, nineteen days after inoculation. The dissection showed no evidence of tubercle. The microscopic sections, prepared from its spleen and great omentum, show no degenerative changes or bacilli.

Granulations, from the mastoid, show young granulation tissue, but nothing indicating tuberculosis.

Case 15.—Mr. C. The granulations from the mastoid antrum were prepared and inoculated into guinea-pig No. 22 on Jan. 11, 1900, its weight then being 502 grms. Fifteen days after inoculation it died, its weight being 514 grms. In the peritoneum near the seat of the inoculation there was a small gray point of the size of a pin's head; five or six other similar points were found in the great omentum. Films were made from two of these. Other organs showed no abnormal appearance to the naked eye. Microscopic sections of the spleen and great omentum and the films show no changes indicating tuberculosis.

Case 16.—C. S. Granulations taken from the mastoid on Nov. 11, 1900, were prepared and inoculated into guinea-pig. No. 23 the same day; this guinea-pig then weighed 445 grms.; it died four days later, of what cause is unknown, as all its organs looked normal.

Case 17.—L. F. On several occasions more than a dozen films of the pus from the external auditory meatus were stained, which showed the following: numerous groups of cocci arranged as diplococci and staphylococci, and also a large number of stout short bacilli, quickly decolorized by the 25 per cent. sulphuric acid, and also many small thin bacilli, which held the red stains more strongly than the first described, but in no way resembled tubercle bacilli.

Case 18.—A. R. The granulations removed from the antrum Jan. 20, 1901, were prepared by alcohol method. They show ordinary granulation tissue only. Sections of the mastoid gland, removed at the same time as the granulations, show no degenerative changes.

Case 19.—Mrs. W. The granulations taken from the mastoid at the operation Jan. 31, 1901, were prepared and inoculated on the same day into guinea-pig No. 25a, which then weighed 574 grms. On March 21st it was killed and then weighed 712 grms. The dissection showed it to be perfectly healthy.

RESULTS OF BACTERIOLOGICAL DIAGNOSIS, ETC.

Inoculation.—The presence of a *caseous nodule at the site of inoculation* is, I believe, an important point in determining whether a guinea-pig which is found tuberculous is so as the effect of inoculation. Of the eight guinea-pigs which were found tuberculous on dissection during my experiments, all showed tuberculous nodules at the site of inoculation on the seventeenth day.

My experiments also demonstrate that, where naked-eye tubercle is not present in some of the abdominal lymphatic glands, the great omentum or spleen of a guinea-pig after intraperitoneal inoculation, it is unnecessary to seek for it by microscopic inspection in sections of these tissues.

It is doubtful if the inoculation of a guinea-pig intraperitoneally with pus suspected of being tuberculous is a reliable method of investigation, judging from the result obtained in Case 9, for here the clinical history and symptoms pointed strongly to the ear disease being tuberculous, yet the inoculation experiment gave a negative result. Previous observers[1] have shown that, as a rule, very few tubercle bacilli are present in tuberculous pus, hence all this experiment proves is that tubercle bacilli were absent from the pus experimented with. The result of the experiment, nevertheless, is instructive, as it demonstrates one important fact, namely, that a guinea-pig injected intraperitoneally with pus may not necessarily develop septic peritonitis, for it lived twenty-three days after inoculation, and on dissection showed neither peritonitis nor tubercle. The whole of my inoculation experiments tend to bear out the view that guinea-pigs are but slightly susceptible to septic organisms, and are consequently suitable for the detection of tubercle. Of the 26 guinea-pigs inoculated by the intraperitoneal method during my experiments, only one, that in Case 16, died before the seventeenth day, when tubercle, if present, would have been visible to the naked eye, according to Delépine's researches.

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[1] Schlegendal, quoted by Cheyne in his work, *Tuberculous Disease of Bones and Joints*, p. 79.

Cheyne (W.), *Tuberculous Disease of Bones and Joints*, p. 80.

Granulations.—A method of investigation recommended by Brieger seems to hold out a promising result; it is that of securing a granulation or a small piece of the diseased mucous membrane from the middle ear, and examining microscopic sections of it for caseating areas, epitheloid cells, and bacilli. I was able to do this in only one of my cases, which proved to be tuberculous, Case 1; but the changes found were most pronounced and definite. Granulations from the mastoids of several other cases (6, 11, 13, 14, and 18) were examined in a like way with a negative result, and in each the inoculation experiment confirmed the negative opinion formed from the microscopic appearance of these specimens. The microscopic examination of an enlarged mastoid gland would also throw valuable light on the diagnosis when the ear on the same side is diseased, *e. g.*, Cases 1 and 18.

Films.—The staining of films of pus from the tympanum is an aid to diagnosis in tuberculous otitis; but the small number of tubercle bacilli usually found in pus renders this method very laborious as a means of demonstrating that organism. A dozen or more films may be stained for bacilli in a known tuberculous case, without giving a positive result. In guinea-pigs, even when the films are made direct from a tuberculous nodule, my experience is that this method is not very satisfactory, as not more than 15 % of such films show the bacillus.

this modification of the carbol-fuchsin method, these formaline fixed sections could be perfectly stained and made to show distinctly the structure of the tissue, the caseous nodules, the tubercle bacilli, and epitheloid cells. In some of the sections, which by the ordinary method showed no bacilli, or only a few, this method showed them to be present in great numbers.

C.—For tissue elements the staining was done by the ordinary hæmatoxylin and eosin method.

The microscopic examination of specimens.—This was done with one-fourth, one-sixth, and one-twelfth (oil immersion) lenses, a mechanical stage being used.

Microscopic and Inoculation Experiment Reports.

CASE 1.—M. W. The left mastoid gland and the granulations from the left mastoid antrum, removed at the operation, Dec. 27, 1900, were prepared for section cutting by the absolute-alcohol method, and the sections stained by staining method A (as were all specimens in this case).

Sections of the gland show numerous caseating areas in various degrees of advancement, a few giant cells, numerous epitheloid cells, and tubercle bacilli. The bacilli are most numerous in the more advanced caseating areas; here the bacilli have mostly the beaded appearance.

The bacilli in and about the epitheloid cells are less numerous, and do not present the beaded or spored appearance, being stained throughout their whole length. In several microscopic fields, with a one-twelfth inch oil immersion lens, between twenty and thirty bacilli were counted. Some portions of this gland present the normal lymphoid appearance, with no epitheloid cells or bacilli.

The granulations above mentioned were pale and flabby, and caseous-looking points were visible in them. The caseating foci were very distinctly seen during the process of rubbing up, in sterilized salt solution, in preparation for inoculation into the guinea-pig, the residue in the mortar having an appearance closely resembling grated cheese. Microscopic sections of these granulations show much the same appearance as that seen in the gland just described, there being caseating areas, epitheloid cells, and tubercle bacilli, but no giant cells. In one field more than sixty of these bacilli were counted, and, as in the last specimen, they are most numerous in the caseating areas, where most of them show the beaded appearance.

An emulsion was made of some of the granulations and centrifuged ; films made from the deposit and stained for tubercle failed to give a positive result.

Sections of the adenoid tissue removed from the naso-pharynx and stained for tubercle show numerous advanced caseating areas, and around them epitheloid cells. In some of these nodules tubercle bacilli are seen in great number ; more than a hundred were counted in one one-twelfth inch microscopic field. Some of them are single rods, stained throughout ; others have the spored appearance ; several have the V-shape arrangement ; and a few look as if they were branched.

The mucous membrane removed from the mastoid antrum and tympanum of the right ear, when cut and stained, shows microscopically numerous caseating areas in various stages of advancement, around which are many epitheloid cells. Tubercle bacilli are also present.

Sections from the right tympanic membrane (which on its external surface looked normal, and on its mucous surface showed thickening and pale nodules) are found microscopically to disclose the following characteristics : Its whole stratum mucosum is infiltrated with the tuberculous process, and tubercle bacilli are present in considerable number, especially towards its tympanic surface. No giant cells are present. The mucosa is much thickened, and the caseous degeneration extends throughout its whole substance. The fibrous membrana propria is very largely unaffected, although the mucosa in immediate contact with it is in an advanced stage of tuberculous degeneration ; at a few points, however, it has been partially destroyed by the disease and has almost disappeared, while here and there throughout its substance a tubercle bacillus is seen in what otherwise looks normal tissue. At the parts of the membrana propria where destruction has taken place, the appearance is that of erosion and not of infiltration. The cuticular layer is more extensively involved than the membrana propria. It shows a considerable number of tubercle bacilli in various parts, and a few epitheloid cells, showing that the disease was commencing to make rapid progress there. The condition of the membrana propria shows that its fibrous structure offers a stubborn resistance to the spread of the disease to the gathered from a careful search of the literature of early middle-ear tuberculosis, the changes observed microscopically in this tympanic membrane (p. 220, lower half) have not previously been described.

That advanced tuberculous infiltration of the mucous membrane of a middle ear may occur without producing objective symptoms in the outer surface of the tympanic membrane, is proved by the observations just recorded. How long the right middle ear had been tuberculous (in this case) must be a matter of conjecture; yet when one considers the comparatively slow progress of tuberculous infiltration and degeneration as observed in tuberculous guinea-pigs, it may be assumed that the disease had been present in this tympanum for at least two weeks.

The path taken by the bacilli in finding their way to the tympanum, in this particular case, was clearly by the Eustachian tube, as they were traced from the tuberculous adenoids in the naso-pharynx along the sub-mucous and lymphoid tissue layers of the Eustachian tubes (as shown by the sections made from different levels of the tubes, already described), and this view is confirmed by the absence of tuberculous infiltration in the tissues of the tubes and right middle ear other than their lining membrane, which would have been infiltrated by the disease had the bacilli found an entrance from the general system by the arterial supply, and on the right side the condition of the tympanic membrane proves that they did not find an entrance through it.

Although it cannot be proved that the first bacilli which reached the right tympanum did not get there mechanically, by means of a fragment of infected mucus from the naso-pharynx being forced up the tube by air pressure, it is much more probable that they entered by direct extension along the submucosa of the tube, since tuberculous infiltration was present in the lining membrane of tube throughout its whole length.

Microscopic sections of granulations from the left middle ear (Case I) likewise show typical tuberculous degeneration, caseation, epitheloid cells, and bacilli, and the glands along the Eustachian tube, the mastoid glands, and other glands in the neck were similarly affected.

Another point of interest observed was the great number of bacilli present in the mucous membrane of the right and left middle ears, in the lymphoid tissues along the tubes, as well as in the lymphoid tissue in the naso-pharynx.

The mastoid gland and granulations from the middle ear on the left side were examined ante mortem and gave positive results, consequently similar microscopic examination in other cases might prove helpful in diagnosis.

The free passage of blood down the Eustachian tube during the operation on Case 1 supports Ostmann's theory,[1] that in wasting diseases the Eustachian tube becomes more patent, and the extreme thinness of the left tegmen tympani and the pallor of the dura mater over it show that the disease was making its way towards the brain.

Analysis of Cases.

The following facts are brought out by an analysis of the nineteen cases investigated:

Percentage of tuberculous cases. — A satisfactory proof as to the presence or absence of tubercle was obtained in 18 of my cases, 5 being tuberculous and 13 non-tuberculous; in the remaining case tubercle cannot be held to have been excluded; thus tubercle was the cause of the ear disease in 26.3 % of the cases investigated. In 21 % of the cases (6, 7, 10, and 11) in which tubercle might have been expected, inoculation experiment proved it to be absent. Microscopic examination of mastoid granulations in two of the cases (6 and 11) confirmed the negative result obtained by inoculation experiment.

Ages. — The ages of the five cases in which tubercle was proved varied from five months to seven and a half years, four being under five years. The ages of the thirteen non-tuberculous cases ranged between three years ten months and forty-seven years, three being under five years.

This result points to the greater frequency of tuberculous otitis in children under five years than in persons over that age.

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[1] *Wiener medicinische Presse*, 1898, p. 662.

Condition of the bone. — Twelve (or two-thirds) of my cases showed destruction of bone in the neighborhood of the middle ear, while only 5 (or 41.6 %) of these were tuberculous, thus showing that over 50 % of my cases with bone lesion were non-tuberculous, a result which is in marked opposition to Milligan's statement[1] that "a large proportion of the cases of suppurative middle-ear disease with accompanying bone lesion met with in practice are tuberculous." If we consider separately my cases which were under five years of age we arrive at a different result, for we find 66 % of those with bone lesion were tuberculous, while in those of my cases over five years only 16 % were tuberculous; consequently my results would confirm Milligan's statement if we modified it by adding to it *in children under five years of age.*

The fact that Bezold's perforation occurred in about 20 % of both my tuberculous and non-tuberculous cases also points to a considerable destruction of bone being present in many cases of non-tuberculous middle-ear disease. In the non-tuberculous cases the Bezold perforation was much later in appearing, after the onset of the ear disease, than in the tuberculous, which shows that destruction of bone is more rapid in tuberculous cases.

Bare bone was felt through the meatus in 40 % of the tuberculous cases, and in 21.4 % of the non-tuberculous cases.

The destruction of bone about the middle ear was chiefly in the mastoid process, and was great in all the tuberculous cases and in 53 % of the non-tuberculous.

The fact that great destruction of bone and hollowing out of the mastoid process are frequent in tuberculous cases, with comparatively slight subjective and objective symptoms, seems due, first, to the painless nature of tuberculous disease generally, and second, to the fact that the mastoid process has a cortical layer of hard bone which resists the advancing disease for a much longer time than the more vascular and cancellous bone beneath.

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[1] W. Milligan, *Transactions of Sixth International Otological Congress*, 1899, p. 35.

Complete perforation of the outer surface of the mastoid process occurred in only one of my cases (Case 7), but in all the tuberculous cases the shell of the bone which covered the diseased bone and granulations beneath was very thin, while in only four of the non-tuberculous was this the case. In four this layer of bone was only slightly thinned, and in two it was thickened and sclerosed. In the remaining three cases the mastoid was not opened.

In all the tuberculous cases the diseased bone about the mastoid cavities was softer than in the non-tuberculous, consequently this symptom affords some indication as to the nature of the disease.

A sequestrum was found in 20 % of the tuberculous cases and in 15 % of the non-tuberculous cases. Of these sequestra it cannot be said that any of them presented distinctive characteristics, excepting microscopically.

Facial paralysis. — Facial paralysis was present in 60 % of the tuberculous cases, and in 33 % of the non-tuberculous, but the onset of the paralysis was at a much earlier stage of the disease in the tuberculous. In two-thirds of the non-tuberculous it was a late symptom, appearing more than a year after the discharge commenced. This shows that facial paralysis is not only more frequent in tuberculous cases, but that when it is present as an early symptom it strongly points to the ear disease being tuberculous.

Ear affected. — In the tuberculous cases the discharge appeared first in the left ear in 60 %, while in 40 % of them the other ear is known to have become tuberculous. In the thirteen non-tuberculous cases the left ear was affected first in 53 %, and suppuration subsequently appeared in the other ear in 26 %. This observation indicates that one ear is first affected about as often as the others, but that the second ear becomes involved more frequently in tuberculous cases.

Duration of the discharge. — The duration of discharge in the tuberculous cases was from ten weeks to two years and nine months; in the non-tuberculous, from four days to many years — in one case thirteen years. Thus the average duration in the non-tuberculous was much greater, and indicates a worse prognosis in the tuberculous cases.

Pain. — In none of the tuberculous cases did the discharge follow an acute illness, and in 80 % it commenced without any history of pain. In the one tuberculous case (Case 2) in which there was a history of pain preceding the discharge, both ears had been suppurating for more than a year, and during that time the patient had been living in a house with two advanced cases of phthisis, consequently it is conceivable that the tuberculous ear condition may have been a secondary infection and not the primary disease.

In seven, or 53.85 %, of the non-tuberculous cases the onset of discharge was associated with acute pain, and was also associated with an acute illness, — in three cases with measles (6, 13, and 19), in three others with acute catarrh (12, 17, and 19), and in one influenza (14). In one case (11) the onset of discharge was painless, while with regard to the remaining five cases no clear history was obtained on this point. The absence of evidence of pain in the diseased ear was thus a marked symptom in the tuberculous cases, while its presence was frequently observed in the non-tuberculous cases.

Tuberculosis in other organs cannot be said, in my cases, to have shown any reliable indication as to the nature of the ear disease, as it was proved to be present in only one case of each group, and in the one case of doubtful nature.

Enlarged glands near the affected ear were present in all my tuberculous cases, and in only two of my non-tuberculous cases, consequently their presence suggests that the ear disease may be tuberculous, while the presence of a *suppurating sinus* in the same position — especially when pale, flabby, and œdematous granulations are found about its entrance — is strong evidence of the ear disease being tuberculous, for a discharging sinus was present near the ear in 80 % of my tuberculous cases, and in only 7.6 % of my non-tuberculous.

The character of the discharge from the ear was very similar in my tuberculous and non-tuberculous cases, being thick, yellow, creamy, and fœtid. There were two exceptions, one a case of cholesteatoma, where the discharge contained solid, cheesy particles, and the other (Case 9), which was of a doubtful nature, consequently this symptom did not produce any evidence in my cases for or against the disease being tuberculous. This is probably due to the fact that at the time the cases were examined the infection had become a mixed one.

Granulations removed by operations from the mastoid are a more important indication of the nature of the ear disease; for in 80 % of my tuberculous cases they were pale, œdematous, and flabby, and in 76.9 % of my non-tuberculous they were dark red in color and not flabby. Caseating points are sometimes met with in tuberculous granulations, *e. g.*, Case 1.

Tympanic membrane. — In so few of my cases was it possible to obtain a satisfactory view of the perforations in the tympanic membrane that no conclusions can be drawn therefrom.

Nature of the infection. — With reference to the question of whether tuberculosis of the middle ear is more frequently a primary or a secondary infection, my observations were unavoidably incomplete; for although no evidence of tuberculosis was discovered in other organs in four of them, tuberculous naso-pharyngeal adenoids were not excluded, and this I believe to be essential before concluding that the disease had its primary focus in the middle ear, since adenoids from their nature and position are particularly liable to infection, and because it has been proved that latent tuberculosis may exist in that tissue for a considerable time. A digital examination of the naso-pharynx ought to be made in all cases of suppurative otitis media, and should any hypertrophied tissue be felt there it should be removed and examined microscopically for tubercle.

In the only one of my tuberculous cases in which the post-mortem examination enabled this point to be cleared up, tuberculous adenoids were present and had passed unobserved during life. When one considers the intimate connection between naso-pharyngeal lymphoid tissue and the similar tissue in the sub-mucous layer of the Eustachian tube, it is clear that one of these tissues could not long be tuberculous before it would appear in the other. Consequently I contend that following the method above suggested would not only assist in arriving at an early diagnosis, but in cases in which tuberculous adenoids were found their removal would get rid of a focus and breeding ground of this disease (which is specially liable to infect and re-infect the middle ear, and also to infect the lungs and alimentary tract), and would produce a beneficial effect upon the whole future course of the case.

Aural polypi. — No aural polypi were found in any of the tuberculous cases, but they were present in three of the non-tuberculous.

The relation of cholesteatoma to tubercle. — Inoculation experiments proved that the two cases of chronic suppurative otitis complicated by cholesteatoma which I investigated were non-tuberculous, and thus support Scheibe's observations.[1]

Granulation of the operation wound was noticeably slower and feebler in the tuberculous cases than in the non-tuberculous.

CONCLUSIONS.

1. Advanced tuberculous changes may be present in the mucous membrane of the tympanum and of the tympanic membrane itself without producing visible evidence through the external auditory meatus.
2. The membrana propria of the drumhead offers marked resistance to tuberculous infiltration and is only destroyed by a process of erosion. This resistance also accounts for the frequency of multiple perforations in tuberculous cases.
3. Latent tuberculous naso-pharyngeal adenoids and all other latent foci must be excluded before deciding that any case of middle-ear tuberculosis was a primary infection.
4. A high percentage, probably 65–70 %, of cases of suppurative otitis media with neighboring bone lesion, in children under five years, are tuberculous; in older persons, not more than 16 % of similar cases are tuberculous.

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[1] ARCHIVES OF OTOLOGY, 1898, p. 133.

5. Intraperitoneal inoculation of guinea-pigs is a good and reliable method of proving the presence or absence of tuberculosis in granulations from the middle ear. Reliable proofs may also be obtained by examining microscopically such granulations or even an enlarged mastoid gland or naso-pharyngeal adenoids when present.

6. In cases of suppurative otitis media, the absence of ear pain, early and extensive destruction of bone, early facial paralysis, multiple perforations, pale flabby granulations with caseous points in the meatus, about a mastoid sinus, and in the mastoid antrum, and an enlarged mastoid gland point strongly to the disease being tuberculous.

7. The detection of bare bone with a probe through the meatus, the character of the discharge, facial paralysis, and extensive destruction of bone appearing as a late symptom are of doubtful value in arriving at a diagnosis, while the presence of cholesteatomatous masses is positively opposed to tubercles being present.

To Drs. P. McBride and D. Noël Paton I am indebted for much valuable advice and direction. To Dr. P. McBride I also wish to express my thanks for the privilege of observing, studying, and reporting Cases 3, 4, 5, 6, 7, 10, 11, 12, 14, 16, 18, and 19. The operations described were done by him.

In like manner I am indebted to Mr. Stiles for Cases 1 and 2, to Dr. MacKenzie Johnston for Cases 8 and 15, to Dr. Hunter MacKenzie for Case 13, and to Dr. Logan Turner for Case 9. To Dr. D. Patrick of Montreal I am under much obligation for his kindness in preparing the microphotographs.

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REPORT ON THE TRANSACTIONS OF THE SECTION ON OTOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. JOSEPH KENEFICK.

STATED MEETING HELD APRIL 10, 1902.

JAMES F. McKERNON, M.D., in the Chair.

Dr. JOHN GUTTMAN presented a case of **horny degeneration of the lobule of the auricle** in order to get an expression from the Section as to its exact nature. It looked very much like chondroma, but since there is no cartilage in the lobule such a diagnosis was not possible. The growth had lasted about four years. The Doctor had never seen anything like it before.

Dr. T. J. HARRIS reported the histories of the two following cases:

I.—**Otitis media, acute perforation of tegmen tympani, pachymeningitis, death.**

Our still limited knowledge of brain disease as a result of affections of the middle ear warrants the reporting of these cases, especially as in certain important particulars the classical symptoms were lacking.

B. N., æt. thirty, clerk, with no history of previous ear trouble, was seized with severe pain in left ear on the morning of March 11th. He at once consulted his family physician, who performed a paracentesis memb. tympani, and ordered hot douching.

The day following, as there was no diminution in the pain, he sent for me. I saw the case at eight o'clock that night, thirty-six hours after the onset of the attack. The patient was a strongly built man of thirty. There was no suggestion of any neurotic element. He seemed to be in much suffering, saying he must have relief. The temperature was normal. Examination of ear showed a generally reddened drum, with slight prominence of posterior segment. Patient stated that there had been a rather free discharge of pus during the day. The incision of the former paracentesis was not visible; there was no tenderness over the mastoid except in a slight degree at the tip. The patient was advised to enter a hospital, and was admitted to the Post-Graduate Hospital that night, where a free internal Wilde incision was made under primary ether anæsthesia, at ten o'clock. There was no free escape of pus, though the hospital records mention a small amount. The hot douching was ordered continued hourly. The next day there was no alleviation of the pain. This was referred directly to the ear, and never to the mastoid, a symptom which was unchanged during the entire course of the disease. The temperature remained normal, 98.2°, mind perfectly clear, no suggestion of brain trouble. Examination of ear showed no bulging of membrane. With the idea that there might be some gathering of pus to account for the continued pain, the paracentesis was repeated. This time cocain alone was used. Morphine as high as three-fourths of a grain, hypodermically only, slightly relieved the pain. An ice-coil was ordered to the mastoid.

The following day, Thursday, the temperature was 99.4°, pulse 68; condition unchanged; no development of mastoid symptoms. Hot douching and ice-coil continued. Friday, the fifth day of disease, pain in ear was slightly less, but tenderness on deep pressure over mastoid antrum more marked; temperature 102°, pulse 80.

On account of the persistence of the pain and the temperature, it was decided to open the mastoid, which was done that afternoon. The bone was found entirely healthy, the antrum was abnormally far forward, and on account of the entire absence of disease was not opened. In the course of the operation the inner plate of the mastoid was penetrated, and an escape of cerebrospinal fluid from the middle cerebral fossa took place. Time of operation, forty-five minutes. The day following, the patient was feeling slightly easier. Pain did not abate much; temperature 90.2°, pulse 75. But on Sunday, the 17th, his temperature went up to 104° - 106°, pulse 75.

In consultation with Dr. James F. McKernon, it was decided to establish drainage with the middle ear by opening the mastoid antrum, it being feared that there was some retention of pus there. This was done at 2 P.M., assisted by Dr. McKernon. The middle fossa of the skull and the lateral sinus were thoroughly exposed and found in good condition; the mastoid antrum also was free from pus or diseased bone. There was no bulging of the dura. The patient stood the operation well, but did not improve. During the day twitching of the facial muscles was noticed, later pupil of the right eye dilated, together with a ptosis of the right eyelid. At 7.30 P.M., Cheyne-Stokes respiration, temperature 106°, pulse 92. It was decided to explore the cranial cavity. At 11.30 the patient was again anæsthetized, and the original incision carried upward and forward over the temporo-sphenoidal lobe; a large button of bone was removed, the dura incised, and a careful exploration of the brain substance made by means of a long bistoury. An area of softened disintegrated cerebral material was discovered above the attic, but no pus. The wound was dressed with sterile gauze.

The patient did not come out of his delirium, and died, the second day following, in coma. An autopsy on the head was obtained, and revealed a perforation of the tegmen tympani. A blood clot was found in the temporo-sphenoidal lobe, surrounded by an area of softened tissue about one-eighth to one-fourth of an inch in diameter; no pus.

It was not permitted to remove the skull-cap, so the condition of the deeper parts could not be ascertained.

II.—**Thrombosis of lateral sinus without manifest mastoid involvement. Operation including ligation of jugular vein. Recovery.**

W. G., age twenty-one, was admitted to the Manhattan Eye and Ear Hospital, April 3, 1901, with the following history: For twelve days previous he had been suffering from pain in the left ear, with slight discharge; eight days ago experienced difficulty in mastication, and cheek became swollen; pain in the ear extended to the whole side of the face.

Note on admission.—Temperature, 98.2°; pulse, 80; respiration, 20; slight pain in ear; no tenderness or pain over mastoid antrum or tip. Examination of ear showed no bulging of drum membrane, but an old perforation in anterior segment. There was considerable swelling of the glands extending into the neck; opening of the mouth caused pain; there was a slight discharge from the ear; tongue coated. Hot douche was ordered to the ear hourly, ice-coil for the swelling over neck. Patient was a strong, muscular fellow with no history of previous illness, and showed, when seen the next day, no evidence of serious sickness. In the course of forty-eight hours the swelling in neck had disappeared, but the patient began to complain of pain in the head; this was present over the temporo-sphenoidal lobe of the left side for a short time, but soon became localized over the frontal lobe; the temperature remained fairly normal until about the sixth day, when it began to show considerable variation, until on the seventh it rose to 105°. At no time while in the hospital did the patient have any distinct chill or even chilly sensation. No tenderness at any time was apparent over the mastoid.

On April 8th, it was decided, because of the two symptoms, persistent cephalalgia and elevated temperature, to operate. The usual mastoid operation was first performed, and the mastoid antrum thoroughly opened; no pus or other disease was discovered in the mastoid cells—at the most, a doubtful softening of the bone in one or two areas. The lateral sinus was then exposed. In the sigmoid groove at the knee it presented an unhealthy appearance, but pulsation was distinctly present. After a careful disinfection with sterilized water and alcohol, the sinus was aspirated; nothing flowed. The wall was then carefully incised posteriorly, and a thrombus was found extending back as far as the torcular and downward to the bulb. After still further incising the wall of the sinus, this was carefully removed with the blunt curette. No marked flow of blood followed the removal from the torcular, and only a partial flow from the bulb. The sinus was then very gently irrigated with sterilized water and packed with iodoform gauze. The patient did well for the first week after the operation, but did not have an entirely afebrile temperature. The thrombus appeared to be a healthy one. The general condition of the patient was fairly satisfactory, but showed something of a septic nature. About April 18th, however, six days after the operation, he did not seem so well; and in spite of the healthy appearance of the sinus wound fear began to be entertained that further infection was proceeding from the jugular vein. Accordingly, upon April 22d, the patient was again anæsthetized, and the jugular vein was opened in the usual manner. There was a slight blood-current passing through, but this was decided to be proceeding from the facial vein. (The vein was accordingly ligated in this situation and removed.)

Wound closed, and the patient returned to the ward. For the first few days after the operation his condition was profoundly septic; pneumonia, limited in area, was discovered. Gradually, however, by the liberal use of stimulants, especially strychnine and nitro-glycerine, used at first hypodermically, his condition began to improve, until he went on to recovery, and was discharged from the hospital, May 12, 1901.

These cases present several points of unusual interest.

Case 1 is peculiar, in my own experience at least, for the acuteness and intensity of the symptoms and the early communication of infection to the brain through the tegmen tympani. It will be noticed that early paracentesis of the drum was performed, and that without marked bulging, and further that no involvement of the mastoid cells was at any time discoverable.

In the light of our present knowledge, any procedure other than those that were adopted does not seem possible. The condition was a rare one, and the only symptom peculiar to it was intense localized pain in ear, without signs of pus retention in tympanic cavity. The pus unfortunately was not examined, and its virulency accordingly not ascertained.

Case 2, who is presented to-night for your inspection, also offers several points of interest. Of these, the most important was the entire absence of all pain or tenderness over the mastoid and the absence of all chill while under observation. This is unusual in the extreme, and yet, as Dr. McKernon has rightly said, we do not need to look for a chill. The history of chilly sensation will be sufficient in a given case; and, further, the chill may have occurred before patient entered hospital. Finally, the important question is suggested of the advisability of exposing the jugular vein. At the time of operation in our own case, there seemed to be no special indication for so doing, and yet undoubtedly the patient was in better condition for the operation at that time than later, and would have been saved, in all probability, the subsequent septic absorption.

Dr. THOMAS R. POOLEY had recently seen a case in consultation with Dr. S. Beach Jones, of this city. Dr. Janeway had also been associated in the treatment of the case. About two weeks ago he saw the patient between nine and ten o'clock at night, suffering from pneumonia. The history he gave was that his illness began with grippe, which was soon followed by an acute inflammation of the middle ear of the left side with perforation of the drumhead and a copious discharge of a sanguinolent fluid.

He came under the physician's care because of pneumonia. Dr. Janeway saw the case several times in consultation, and the question was raised whether or not there might not be a sinus thrombosis; it was a very difficult matter to decide, for the conditions were these: The patient was in a semi-comatose condition, and therefore it was impossible to elicit any information as to the tenderness over the mastoid region; there was no redness, œdema, or swelling; there was no induration in the course of the jugular vein or any of its emissaries; examination of the membrana tympani showed a perforation in the inferior-anterior quadrant, and the discharge had never become purulent. The special point of interest in this case was in reference to the temperature chart, because in such conditions one naturally expected to establish a diagnosis of thrombosis of the sinus from the history of the temperature. There had been only one initial chill, which was supposed to mark the beginning of the pneumonia. The temperature had never been above 103°; there had been no rapid rise and fall such as would characterize thrombosis and sepsis. He was relieved from any embarrassment incident to the failure in making a diagnosis by the death of the patient the following morning.

The Doctor was quite in accord with what had been stated as to the absence of an extreme rise and fall of temperature in cases of sinus disease in some cases, and he had found no literature which emphasized that point which was such a remarkable feature in the report of the cases. He said that we must all think of the pneumonia as being of possible septic origin, caused by sinus thrombosis, in all such cases where ear disease existed.

Dr. WENDELL C. PHILLIPS said that he had been present at both operations upon this patient, and he was very much impressed by the absence of one of our so-called classical symptoms of mastoid disease—the entire absence of tenderness. During the several days that the patient had been under observation, there had been no time when there could be elicited the slightest degree of tenderness over any portion of the cortex, and it was only because there were present the suppuration and the other symptoms already described that had led to operative interference. If he remembered correctly, he expressed himself at the time as being extremely doubtful whether there was much disease there. Finally the symptoms became so marked and pronounced that it was decided to operate and locate the pus. Another point of interest was in reference to the internal jugular vein; there was but little difficulty in tracing it upwards until the last branch had been tied; from that point there was nothing to be noted except a cord.

The case was to him of special interest because it did not give all the symptoms which should accompany sinus thrombosis.

In reference to the second case, it simply emphasized the fact of our utter helplessness in cases of lepto-meningitis.

Dr. FRANCIS J. QUINLAN said he was especially interested in the report of the last case, because he had recently seen in his service at the City Hospital an identical one with the same objective and subjective symptoms. The patient was a woman who had an acute middle-ear trouble for two or three days, and complained of lancinating pain over the mastoid and auricle. Examination showed the sagging of the posterior-superior part of the canal, as well as a deep bulging and congestion of Shrapnell's membrane. A free incision was made in the drumhead and posterior canal wall to get good drainage as speedily as possible; two or three drops of pus followed this flap-incision, and the woman felt comfortable during that night and until four o'clock the day following, when the pain returned. The temperature chart showed a rise of a degree and a half; then it went down, and again, at the end of two or three days, it rose to 104°. The patient became very irritable, indifferent to surroundings, sank into stupor from which she could be aroused, but took little interest in things about her. Lumbar puncture was made, I think, and a serous fluid obtained; meningitis was excluded. Drs. Brewer and Hammond made the diagnosis of brain abscess, and at their suggestion I opened the mastoid, and found absolutely nothing to give evidence of caries or necrosis. The tympanic cells were clean; no pus was found in the antrum; nothing present but what showed an apparent normal condition. It was then decided to explore the temporo-sphenoidal lobe, which was done by extending incision 1½ inches upwards; the dura was found to be mottled and bulging. A free incision was made into the temporo-sphenoidal lobe and it was explored for a distance of 1½ inches, but no pus was found. Drs. Hammond and Brewer, who were present at the operation, both believed that an abscess was present, although it was not located.

Dr. GEORGE L. RICHARDS, of Fall River, Mass., contributed a paper entitled **chronic suppurative otitis media: When should radical surgery be employed in its treatment, and of what**

should this consist? He said that nearly every case improved under treatment, and even may dry up for a time, but that it was almost sure to start up again; he therefore believed it to be the aurist's duty, after a reasonable time, to place before his patient the question of a radical operation, stating the possible dangers incident to a suppurative ear, and explaining that although no serious complications may result, yet the danger is always present, and when that danger comes there may be no warning. Hearing, he stated, was improved by the operative procedures, because material which was a hindrance to the passage of sound waves was removed. He believed the time was not far distant when otologists would urge upon their patients the desirability and need of thorough cure. The question of operation resolved itself into two methods: First, that of clearing out the contents of the tympanic cavity through the external canal, known as ossiculectomy; and second, the so-called radical operation, with its various modifications. The operation of choice should be the one which allows of healing taking place from the bottom of the diseased cavity and provides for free drainage during the healing process. The operation of ossiculectomy had the advantage that it can be done through the external canal, requires no external wound, has but a short deprivation of work, etc. Among the disadvantages are: the attic is not visible, the curettage is mostly done in the dark, and one can never be sure that all the disease has been removed. The radical operation consisted, he said, in the throwing of the cavities of the middle ear, the attic, and the antrum into one, with the removal, as far as possible, of all carious or diseased bone, and of the ossicles with the exception of the stapes. There were two methods of performing the radical operation, that of Stacke and that of Zaufal. Dr. Richard's cases only remained in the hospital twelve days, and were back to work about three weeks from the time of operation. No troublesome symptoms followed. Three of his patients had complained solely of long-standing suppurative otorrhœa; these cases were finally cured over periods varying from five weeks to three months. The hearing and the general health improved in each case. His fourth case was that of a boy who had suffered from a chronic discharge from each ear, with diffuse mastoiditis on the left side. After three attempts to cure by Schwartze's method, he did the radical operation, which was followed by cessation of the discharge. The fifth case was one where acute symptoms supervened on an old otorrhœa; in this instance he did a plastic operation after the manner of Koerner, which was followed by good results.

In spite of the fact that many otologists still believe in the palliative treatment of chronic suppurative otitis, and although Koerner stated that he saw brain symptoms occur only twice in 2207 such patients, and that he did not fear the threatening brain symptoms to such a degree as to acknowledge the Stacke operation to be a prophylactic measure, and in spite of the fact that cases in which the indication for the radical operation as stated by Stacke was present are sometimes cured without operation, Dr. Richards nevertheless believed, in view of his experience at home and abroad, and in view of the many reported cases of serious brain and sinus trouble which were constantly being brought to our attention in otological and general medical literature, that it was our duty in all cases of suppurative otitis media which were not cured within a reasonable length of time, to urge upon the patient the need of more radical surgery for the removal of the entire diseased area and the promotion so far as possible of a positive cure.

Dr. EDWARD B. DENCH said that it gave him great pleasure to open the discussion on this paper, because he thought that the statements made by the reader of the article were in accord with the sentiments of all present. For a number of years he had been inclined to take the view mentioned by the Doctor in the early part of the paper—that is, that a large proportion of cases of suppurative otitis media could be permanently cured by measures less severe than the radical operation. By this he meant that many cases of chronic purulent otitis media could be permanently relieved by the simple removal of the ossicles and the thorough curettement of the tympanic walls. Later experience had taught him, however, that many of the cases operated upon in this way, and in which a permanent cure seemed to have been established, required later a second operation, owing to a recurrence of the otorrhœa. In a number of these cases he had found it necessary, after a lapse of several years, to perform a radical operation in order to relieve the discharge from the ear. For this reason he thought that the paper was very appropriate and timely. Many of those present were still doing the simpler operations, and undoubtedly they were now becoming dissatisfied with their results.

Upon one or two points mentioned in the paper he could not take the same view as that taken by the reader. This was especially true concerning those remarks which referred to the hearing of the patients after a radical operation. He was certain that the results, especially with regard to the power of audition, were not as good as after a simple removal of the ossicles. Concerning the advantages of the radical procedure in affording a clearer operative field, it has been his experience that although the operative field was wider, the view of the deeper parts was hardly as clear as when the simpler operation was performed through the external auditory meatus. In doing the radical operation there must necessarily be considerable oozing from the divided structures. This hemorrhage certainly obscured the deeper parts and rendered the manipulations of the surgeon less exact than where the operation was performed through the external auditory canal. This was especially true in cases where the external auditory meatus is unusually long and narrow, and where the antrum is small and the mastoid process sclerosed. In such cases the field of operation in the radical procedure is exceedingly narrow. If this field is extended by the removal of perfectly healthy bone, the bleeding from this osseous surface is considerable; important landmarks must be removed, and the operation is conducted with much less certainty than in those cases where it is carried on through the external auditory meatus, with the normal landmarks in position. It is almost impossible to get a very wide field of operation without imperilling important structures, such as the dura and lateral sinus. The hemorrhage, which must necessarily attend any radical operation, must of necessity obscure the field of vision, and in many cases this hemorrhage so obscures the parts as to more than compensate for the increased operative field.

He was still of the belief that where the disease was limited to the ossicles and the external wall of the attic, with, perhaps, the involvement of a small portion of the roof of the tympanic cavity, and where the parts were easily accessible through the external auditory meatus, the simple operation of removal of the ossicles with curettement of the tympanic cavity through the canal, was still the operation of election. He was impressed with one point brought out by the reader of the paper, and that was that we should tell our patients when about to perform the simpler operation, that at some future time it might be necessary to adopt the more radical procedure. In other words, the patient should understand that the simple removal of the ossicles was merely an intent on the part of the surgeon to avoid the graver operation; but that this latter procedure might at some time become necessary. He believed in all cases where suppuration was profuse or where there was a cholesteatoma present that, as a rule, the radical operation should be done. He mentioned, however, that in a few cases which had come under his observation where a cholesteatomatous deposit was limited to the tympanic vault, a complete cure had been effected by the simpler operation. In all cases, however, in which extensive destruction of the intratympanic structures had taken place, with widespread involvement of the tympanic walls and extension to the mastoid cells, with or without the presence of extensive cholesteatomatous deposits, he believed that the radical operation was the only procedure which promised the patient permanent relief.

He was interested in hearing the Doctor describe the various methods of forming the flaps in performing the radical operation. He had recently modified his operation in one case, and instead of splitting the canal horizontally along its posterior aspect and then making an incision at right angles to this horizontal incision, so as to form quadrilateral flaps, he had split the canal along its superior aspect, well out into the concha, and from the outer extremity of this incision, had made a vertical incision downward through the concha to the inferior walls of the meatus, thus forming one broad uniform flap. By removing the conchal cartilage from the outer extremity of this flap, a skin flap had been formed, which applied itself perfectly to the floor of the bony cavity and covered completely the spur of the posterior wall and facial ridge. Epidermization had occurred very rapidly in this case. He believed that the manner of forming the flaps must vary with each individual case. He frequently made a tongue-shaped flap comprising the entire cutaneous lining of the concha, the cartilage being dissected out completely. This flap was then drawn upward and backward and sutured to the corresponding raw surface in the posterior wound. The flap was sutured by means of catgut sutures, which would be absorbed in the course of four or five days. The procedure differed in this regard, from that of Ballance, in which a flap, formed in a similar manner, was brought in apposition with the corresponding raw surface above by means of retention sutures passed through the healthy skin. This particular flap operation was applicable to certain cases.

Regarding skin grafting by the Thiersch method in those cases, he said that he had only employed the procedure in one instance. In this case, it had not been necessary to open the posterior wound in order to apply the grafts to the middle ear, as, owing to the enlarged meatus which resulted from the radical operation, it was entirely possible to apply these grafts to the walls of the bony cavity, including the internal wall of the middle ear, directly through the external auditory canal without reopening the posterior wound. The result in this case had been perfectly satisfactory and epidermization had occurred rapidly.

Dr. ROBERT C. MYLES said we were indebted to Dr. Richards for his timely paper and he was very grateful for the opportunity of hearing it because the literature did not give all the information wanted. The problems presented by different cases are not alike and otologists were all wishing for some method by which a permanent and complete cure could be obtained. He had tried the removal of the membrana tympani with the ossicles and then had to resort to the radical operation. His most grateful patients to-day were those upon whom he had done this operation. In his operations upon cadavers he had noticed the frequency with which chronic disease in the mastoid cells was found ; it was quite common to find large polypi in the cells, or the cells full of pus, in those who were brought to the morgue. In these cases he believed there were two sources of danger: (1) from a gradual necrosis of the bone which extended to the tegmen tympani, or through the lateral sinus; (2) from sepsis transmitted either through the veins, the lymphatics, or other channels. Such dangers may arise at any time. Many patients refuse to have more done than splitting the drum and pouring alcohol in, and they get well ; often with these cases it is only a question of drainage. But the important points that struck him were as follows: First, the damage that was likely to follow when the chisel, mallet, and other instruments were used, on account of the variations in the anatomy ; second, when the chisel and mallet were used before enough time was taken to permit the flow of blood to subside ; if these points were more often noted he did not think there would follow so many evil consequences to the facial nerve or the cranial cavity.

A point that he had never been able to find in any literature related to the detailed daily after-treatment of these cases, which aimed at the cleansing of certain crevices, or pockets, where pus continued to be formed. In some patients that he had operated upon for local physicians there were present pockets and, after three or four months, these patients came back with the discharge of pus continuing. He thought these daily details of the after treatment were very interesting and should be more carefully considered.

Dr. **James F. McKernon** said he was very much gratified to have heard the paper read and particularly to have heard the Doctor say that a guarded prognosis, both when operating through the canal and also in doing the posterior operation, should be given; he believed that such a guarded prognosis should always be given and it would save us much unpleasantness which might come up later. He also advised informing the patient of the dangers which might result from long-continued suppuration; every patient, whether a child or adult, should be informed of these dangers from pus infection and the intracranial complications which may follow.

He had done the operations referred to and, during the past two years, he had been doing a combination operation, *i. e.*, a partial Stacke operation, first going into the mastoid antrum and clearing out and making complete drainage between the mastoid antrum and the middle ear, and then removing the under surface of the posterior wall and angle, chiselling in from above, removing the entire under surface of the posterior wall, and enlarging the opening sufficiently to go in and remove all the diseased tissue. He had done nine such cases, two within the past three months. The others were entirely healed and no suppuration followed subsequently. Such a procedure did not force the surgeon to do a flap operation. The posterior opening was closed by granulation tissue, which necessitated drainage. In none of his cases had he ever observed any ill results following; in case such ill results should occur in the future he would report them to the Section.

Dr. **Wendell C. Phillips**, after congratulating Dr. Richards upon the paper, made a few remarks which related particularly to his own experience. He said it was a constant source of surprise to him to have so many patients state that they never had had any treatment for the chronic suppuration of the middle ear, and others who have had treatment which has been of such a nature that the patients were made worse rather than better. He therefore believed that Dr. Richards had taken the proper ground when he stated that we should use the palliative treatment only for a reasonable length of time. He believed that we were losing a great deal of time in chronic suppurations by too much delay and by other attempts than radical treatment. It was his habit to say to such patients that local treatment may not be successful and that it may be necessary to resort to operative interference. He believed that if the operator thoroughly understood his anatomy the radical operation could safely be attempted. He was inclined to perform the Stacke operation without any modifications, unless convinced that the mastoid cells were involved. The Stacke-Schwartze operation he thought was indicated in a large proportion of the cases, but not where the extension of the disease had not gone on beyond the antrum of the mastoid bone. A few years ago he had an experience which he thought might be interesting. A man who was an officer of a large life-insurance company came to him and said he never realized what it meant to ask for a life insurance when there was present a discharge from the ear. He was refused because he had at times a slight discharge from the middle ear. He had asked the examiner: "How long must an applicant be free from discharge before he would be accepted?" He replied that the rule was that the applicant should go three years without any manifestations of suppuration before he would be accepted by the life-insurance company. Thus it became an important matter from a life-insurance standpoint.

In his experience as a teacher, he made it a point always to say, in connection with the treatment of suppurations of the middle ear, that there would never be such a thing as chronic suppuration of the middle ear provided the patients could be properly treated during the acute stages, and he shows his students how to treat such cases.

Dr. WILLIAM H. BATES said that in cases of chronic suppuration of the middle ear it would be better for us to say to the patient: "If you have a radical operation done you will be more apt to be cured than if the simpler operations should be performed." He had the pleasure of showing the members of the Section some eight years ago a number of cases in which he had performed the Stacke-Schwartze operation; at that time he was very well pleased with it, and he was still well pleased with it, and he did it whenever the occasion presented itself. He did not mean to say that he always cured the discharge by this operation, because while one removed a great deal of dead bone, or the source of the infection, the Stacke-Schwartze operation did not invariably do it.

Only to-day he saw a patient upon whom he had performed this operation five years ago, and while he had operated thoroughly, the discharge kept up pretty much the same. It was his practice to say to his patient that if the Stacke-Schwartze operation be done you will be less apt to have serious trouble later. He did not feel enough confidence in it to guarantee any patient certainty of cure.

Dr. MAX TOEPLITZ said that he would like to state that there were several cases in which the radical operation had been performed without curing the suppuration, as Dr. Bates had already mentioned, and he mentioned another important point which should be considered, *i. e.*, suppuration occurring in the labyrinth, due in one of his cases to injury of the labyrinth during the operation; in another of his cases the labyrinth was injured through disease. In chronic cases we often find involvement of the labyrinth with tuberculosis, and cholesteatoma in acute cases from scarlet fever. Many times in labyrinthine suppuration the symptoms are latent, and it is very difficult to make a diagnosis of the condition. In operating, he said, it was often very difficult to expose the labyrinth so as to make an examination of the parts and therefore it was necessary to take away the anterior wall of the mastoid as much as possible, and also to remove the upper portion of the external meatus thoroughly, so as to expose the labyrinth in its entire extent. He thought that all were fully aware that Jansen operated upon such cases through the labyrinth, a procedure by no means very easy, and not without danger. In those cases where there is a fistulous tract in the horizontal semicircular canal the fistula can easily be reached; but where the fistula is in the promontory it is far more difficult to get at. To enter the cochlea and labyrinth from the promontory is very dangerous, because the carotid canal may encroach upon it and be in danger of being opened. If you enter the labyrinth from the oval window, it will be difficult to avoid the facial nerve which runs above it. He thought the most rational procedure would be to cut from the inner wall of the mastoid into the horizontal semicircular canal, from which the vestibule is entered and the labyrinth cleaned out. He believed this to be very important, because in his cases, one in which the suppuration had lasted thirty-five years, the after-treatment had been prolonged for six months; after the elimination of the sequestra, cure followed. He emphasized the importance of looking to the condition of the labyrinth.

Dr. George L. Richards, in closing the discussion, said that one, of course, could never be absolutely sure that all diseased bone had been removed. He always told his patients that he operated because of the presence of disease, which he removed as thoroughly as possible, but could not be held responsible for any future progress of the disease in the bone. He also tells the patients: "Almost eighty per cent. of brain abscesses come from chronic otitis media; can you afford to take such risks? Life-insurance companies will not take you at the present time. The operation is practically devoid of serious risk. The chances of cure are good. There is no external scar. The after-treatment requires about six weeks, and this will not cause you any particular annoyance." He said that such a statement appealed to them, and made them believe that it was better to submit to the more radical operation which offered presumptively the probability of a permanent cure.

With reference to the blood in the cavity at the time of operation, of course that was a source of great annoyance. This operation is largely done in that class of cases in which the bone is very hard and chiselling is not easy; therefore, he did not follow any rule in operating, although he preferred the Zaufal operation, because it seemed to give him more room in which to work.

REPORT ON THE PROGRESS OF OTOLOGY IN THE FOURTH QUARTER OF THE YEAR 1901.

BY DR. A. HARTMANN.

Translated by Dr. ARNOLD KNAPP.

ANATOMY AND PHYSIOLOGY.

247. **Ichila Kishi.** On the peripheric course and termination of the cochlear nerve. Dissertation, Halle, 1901. *Arch. für mikroskopische Anatomie und Entwicklungsgesch.*, vol. lix., 1901.

248. **Röthig** and **Brugsch.** The development of the labyrinth in the chick. *Arch. f. mikroskopische Anatomie u. Entwicklungsgesch.*, vol. lix., 1901.

249. **Alexander** and **Kreidl.** Anatomical and physiological studies on the labyrinth of the dancing mouse: II. and III. Communications. *Pflüger's Archiv*, vol. lxxxviii., pp. 509, 564.

250. **Robert Keller.** On the results of injuries in the region of the lower olive in the cat. *Arch. f. Anatomie u. Physiologie*, p. 177, 1901.

251. **Marage.** Some remarks on the otoliths in the frog. *Arch. internat. d'otologie*, etc., vol. xiv., No. 5.

252. **Strohmayer.** Anatomical examination of the hearing sphere in man. *Monat. f. Psychiatrie u. Neurologie*, 1901.

253. **Lucae.** The otostroboscope and its physiological importance. *Arch. f. Ohrenheilk.*, vol. liii., p. 39.

247. The author has studied the histology of the membranous spiral lamina in rabbits and dogs and has critically reviewed the divergent opinions of others upon this subject. Three points were especially investigated: 1. In regard to the structure of the cellular group which is situated in Corti's organ median to the inner pillar. 2. The course of the cochlear nerve between the habenula perforata and the sensory cells. 3. The communications between the terminal fibres and the hair cells. In the cells in the epithelial triangle internal to the inner pillar, the author

distinguishes between the internal hair cells and the non-specific epithelial cell, two kinds of typically formed cells, of which one is round and connected with the nerve. Agreeing with Waldeyer and Gottstein, the author regards these cells as analogous to the subepithelial ganglia of the inner granular layer of the retina. The termination of the nerves in the cells takes place as follows: According to the author's staining method, a new structure appears directly underneath the nuclei of the hair cells; it is somewhat goblet-shaped, stains deeply, and is distinctly separated from the surrounding tissue. With the high power it appears granular. This structure embraces also part of the hair-cell. Continuous with the apex of this structure is a fine thread, which is occasionally seen to be distinctly continuous with the external spiral nerve. The staining method, hæmatin, must be referred to in the original and the results require confirmation. ESCHWEILER.

248. The authors have followed Born's method and have constructed a very instructive model, showing the embryonal stages in the development of the labyrinth of the chick from the age of sixty hours to eleven days. As soon as the auditory vesicle has become closed, it still remains connected with the ectoderm for some time by a solid epithelial band which later disappears entirely; it does not aid in the formation of the recessus endolymphaticus. The intricate changes in position which the labyrinth and especially the semicircular canals undergo in development are beautifully shown in this model. ESCHWEILER.

249. The anatomical examinations were made on four dancing mice, one albino mouse, and four gray domestic mice. Of the dancing mice, three had previously been examined from a physiological standpoint. The labyrinths and cerebral peduncles were cut in serial sections and the results were controlled by a series of specimens from normal mice. The results are as follows: 1. In the dancing mice there is a destruction of the macula sacculi. 2. Destruction of the papilla basilaris cochlea with extension to the surrounding tissues of a varying grade. 3. Diminution of the branches and roots of the superior and middle branches of the eighth nerve. 4. A high-grade diminution of the inferior branch of this same nerve. 5. Moderate diminution of both vestibular ganglia showing diminution in the number of their nerve cells. 6. Marked atrophy of the spiral ganglia.

In the physiological part the anatomical results are compared with the results from the physiological examination. In conclusion certain deductions are made on the function of each part of the labyrinth in vertebrates and in man. Without doubt in the case of the dancing mouse the changes are congenital, consequently a case of congenital deafness in man can only be compared to them.

The third communication treats of the physiology of the newly born dancing mouse. In the young, all of the morbid symptoms of the adult mice are already present, as well as the absence of all rotatory vertigo, movement in curves, clumsiness in a narrow path, etc. It is, without doubt, a congenital peculiarity.

DREYFUSS.

250. This paper is reported because crossed fibres from the olive run to the cerebellum and end in the superior worm of the cerebellum, and injuries occurring in the latter region produce symptoms somewhat similar to those associated with labyrinth traumatisms. An injury to the inferior olive, however, is not followed by any manifest disturbance of motility or equilibrium ; in other words, the olivo-cerebellar fibres have nothing to do with the function of equilibrium. DREYFUSS.

251. The content of the inner ear of the frog consists of a solution of potassium and magnesium and their crystals. Possibly through the density of this fluid favorable opportunities for the conduction of sound are present. The function of the otoliths consists in keeping the sound transmission of this medium as nearly constant as possible. SCHWENDT.

252. STROHMAYER has endeavored, with the aid of systematic microscopical examinations of the temporal cortex, to find the central end-station of the auditory nerve. The material came from the brain of a woman of sixty-three years, a congenital deaf-mute who died from a heart lesion. The cause of the auditory defect seemed to be due to a bilateral defect of the cochlear nerve. In addition, both first temporal convolutions were small, both islands were abnormal, and the posterior quadrigeminal bodies were small. The microscopical examination of the cortex confirmed the supposition that the hearing sphere is situated in the first temporal convolution. The relation of the second temporal convolution to the act of hearing is not a direct but an associated one. The distinct localization of the hearing centre is not possible, as the terminations of the cochlear nerves extend in a most unlimited manner into this convolution. The hearing elements of the temporal cortex are probably to be located in the fourth cortical

layer of the "Hammerberg." The condition of the peripheric auditory organ is, unfortunately, not given. Should it not be said that this is a case of defect of the auditory nerve rather than of the acoustic nerve? The defect is not further described.

BRÜHL.

253. LUCAE is of the opinion that for diagnostic purposes it is not sufficient to determine whether the drum membrane and the malleus are mobile or whether they are able to carry out a great number of vibrations which the sound-conducting apparatus has to deal with in receiving sound. As the human eye is not able to follow the extraordinarily rapid vibrations of the drum membrane, the author has employed the otostroboscope method, which apparently retards the vibrations of the drum membrane so that they become visible. The otostroboscope consists of an ordinary reflector to which a rotating disc with ten holes is applied, permitting an intermittent observation of the vibrations of the drum membrane. The spaces between the openings must be so broad that they will completely cover the mirror opening in their rotation. In the anatomically normal drum membrane the most extensive vibrations take place in the upper and posterior quadrants, as well in the slow as in the rapid vibrations up to one thousand in a minute. In one case of definite sclerosis of the normal drum-membrane, vibrations which had been invisible were made apparent with this instrument. In another patient with hereditary deafness no vibrations were visible with the instrument. In a case of diplacusis which can only be the result of labyrinthine affection, fifteen hundred vibrations were detected in the drum membrane in their various phases by this aid of the otostroboscope. It is not possible from the mobility of the hammer to state what may be the function of the other ossicles. DENKER.

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257. After describing the changes found in the Eustachian tube and drum membrane, tympanum, labyrinth, external auditory meatus, auditory nerve, and facial canal, the following conclusions

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258. The author reports on the examination of a case of deaf-mutism and on one of marked deafness, both of which were carefully observed during life. In the deaf-mute, a boy of thirteen, who succumbed to pulmonary tuberculosis, microscopical examination revealed no changes in the internal ear. A decided thickening of the lining membrane was present. The stapes was adherent to the niche of the oval window and to the Fallopian canal. The oval window was closed by a bony structure and the bone over the entire inner tympanic wall was thickened. These changes are all to be regarded as evidence of previous middle-ear suppuration. Functional examination showed complete deafness for voice, watch, and tuning-forks. If central disease of the auditory nerve can be excluded,—the brain showed no macroscopical changes,—this case shows that the bony occlusion of the round window and the fibrous anchylosis of the stapes are to be regarded as the cause of deafness.

In the second case, the niche of the round window was completely occluded by bone formation on the right side and partly so on the left. The niche of the oval window was not changed on the right side, but on the left was contracted by a hyperostosis of the posterior arm and the stapes was anchylosed to the bony wall. The mucous membrane of both sides was very much thickened. On the left, chronic purulent otitis media was present. There were no changes in the inner ear. Whispered voice was

heard, right, 15 *cm*, ordinary voice, 1.20 *m*; left, whisper 0, ordinary voice 3 *cm*, as well with the ear closed.

Both cases showed that the obliteration of the windows causes a decided deafness. That this, in bilateral cases, is sufficient to produce deaf-mutism appears doubtful to the author, because it is at variance with experience with children with congenital bilateral bony atresia of the auditory canal where there probably is no disturbance in the windows, since these children do not become deaf-mutes but learn to speak in the ordinary way.

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261. The author has followed the recommendation of Schwartze to cure cicatricial stenosis of the cartilaginous canal after traumatism by retracting the auricle and correcting the stenosis by plastic operation, and by removing concentric layers of bone of the posterior meatal wall. In spite of this the tendency to become smaller was present in the canal and the author had a rubber obturator fitted exactly into the external auditory canal. This was worn for four years. After that the lumen showed no tendency to closure. DENKER.

262. In both cases the foreign bodies had been forced into the

tympanum by efforts at extraction. They were extracted by detachment of the auricle and removal of the posterior margin of the bony canal. SCHEIBE.

263. The author has endeavored to improve the hearing in seven cases of perforation of the drum membrane by the introduction of a moist cotton pellet. In two cases there was slight improvement in hearing, though perception for bone-conduction was diminished, so that an affection of the perceiving part of the ear seemed likely. In five cases there was decided improvement. The author has observed momentary improvement, and permanent improvement in the case of the patient who had worn the cotton pellet two or three hours a day for six months ; the hearing was then much better even without the artificial drum.

JÖRGEN MÖLLER.

MIDDLE EAR.

a.—ACUTE OTITIS MEDIA.

264. **Hasslauer.** The bacteriology of acute otitis media. *Klinische Beiträge*, vol. v., No. 3.

265. **Funke, John.** The bacteriology of otitis media. A summary of recorded observations and a laboratory study of seventy-six cases. *Amer. Medicine*, Nov. 9 and 16, 1901.

266. **Jack, F. L.** The treatment of acute otitis media. *Penn. Med. Journ.*, Oct. 5, 1901.

267. **Waterman, O.** A case of suppurative otitis media following influenza, without involvement of the antrum. Complete lack of all constitutional symptoms of inflammatory disease. Operation. Recovery. *N. Y. Med. News*, Nov. 9, 1901.

268. **Smith, S. McCuen.** Some aural complications of influenza. *Penn. Med. Journ.*, Oct., 1901.

269. **McCaw, J. F.** Tuberculous otitis media, mastoiditis and meningitis in an otherwise healthy adult. Report of a case. *N. Y. Med. News*, Oct. 12, 1901.

270. **Ibid.** Influenza as a causal factor in acute mastoiditis and early treatment. *Amer. Journ. Med. Soc.*, Oct., 1901.

271. **Dench, E. B.** The advisability of early operative intervention in acute mastoiditis. Report of a case. *N. Y. Med. Journ.*, Oct. 19, 1901.

272. **Jansen.** Inflammations of the middle ear. *Deutsche Klinik*, vol. viii., p. 193.

273. **Albersheim.** Contribution to the bacteriology of otitis after measles. *Arch. f. Ohrenheilk.*, vol. liii., p. 89.

274. **Alexander, G.** On the operative treatment for opening the mastoid process, with the Schleich local anæsthetic. *Wiener klin. Woch.*, No. 33, 1901.

275. **Hoelscher.** A simple arrangement to procure satisfactory asepsis in operations on the mastoid and skull. *Arch. f. Ohrenheilk.*, vol. liii., p. 36.

264. The author has continued with extraordinary industry the work begun by Leutert, and in the first fifty pages of his treatise has collected and reviewed all that has appeared on the bacteriology of acute genuine and acute secondary otitis media, and in sinus and mastoid complications. A report of 82 personally observed cases follows. These were examined microscopically, by culture, and by animal experimentation. Of the 63 primary otitides, 42 were examined immediately after paracentesis, and 19 after spontaneous perforation. In both groups the diplococcus of pneumonia was found most frequently, next the staphylococcus. Five cases of the first group proved to be sterile, 5 showed streptococci. In the second group the latter were not found at all, and in two cases the bacillus pyocyaneus was present. In the 19 secondary cases, 7 were secondary to influenza but after paracentesis a variety of bacteria were found. The same inconsistency was present in the spontaneous perforations. Consequently it seems that grouping of the otitides from a purely bacteriological standpoint is not a practical thing as a number of varieties are frequently found together.

Finally the author has made some experiments regarding the sterility of the normal middle ear and found 21 ears free from germs, but in 23 there were various pathological organisms present. The bodies were generally examined about thirty-eight hours post mortem. ZIMMERMANN.

265. The various channels through which the middle ear may be infected are, through the blood, through the Eustachian tube, through the tympanic membrane, through the petrosquamous fissure and others, but the most important is by the Eustachian tube. There is no specific germ of otitis media nor is it invariably monomicrobic. The organisms found in their order of frequency, are: Pneumococcus, streptococcus, pyogenic staphylococci, Friedländer's bacillus; and the bacillus of diphtheria is more commonly present than is usually believed. The streptococcus infection is graver and persists longer than the pure pneumococcus infection, but both are usually supplanted by the staphylococci. There is a pure pneumobacillary otitis which is quickly converted into a mixed infection and its gravity depends on the character of the secondary infection. Chronic suppurative otitis is always polymicrobic, and while anaërobic organisms may

play an important part in the pathogenesis of this disease, their constant presence has not been established. Fœtor is due to the bacillus pyogenes fœtidus without anaërobic organisms.[1] Otitic inflammations present different bacteriological conditions in different localities.

In primary tuberculous otitis it is almost impossible to demonstrate the presence of the bacillus in the discharge. Where the disease is suspected it should be looked for in the tissues removed by the curette. An extensive bibliography concludes the subject.

CLEMENS.

266. Particular reference is made in this paper to two stages of acute middle-ear inflammation. First, where there is a hemorrhagic or congested condition with slight, if any, bulging of the drum. Second, where there is a collection of fluid in the middle ear with bulging of the drum. The treatment advised in the first stage is the early use of the Politzer bag most gently performed without producing any increase of the pain. Dry heat is preferred to moist heat and the poultice is unqualifiedly condemned. In the second stage paracentesis of the drum is advised for large or small collections of fluid within the tympanum, whether the drum is bulging or not.

In otitis media serosa or mucosa, the author is partial to early incision of the drum membrane and an expulsion of the fluid contents by Politzerization. Inflation should be continued at intervals until the hearing is restored. CLEMENS.

267. This case is unique because the entire mastoid process was destroyed, while the antrum and the bone surrounding it were absolutely free from all evidences of disease. During the course of the inflammation there was a complete lack of constitutional symptoms. The case recovered, and the hearing, which was practically lost at the time of the operation, finally returned to the normal standard. CLEMENS.

268. Hemorrhagic otitis is considered to be the distinguishing feature of influenza otitis, but while it may not be wholly pathognomonic, hemorrhages do occur from the membrana tympani, auditory canal, upper and lower respiratory regions, the gastro-intestinal tract, and possibly other internal organs. The inflammatory action is intense, rapid, and virulent, manifesting itself in the well known clinical picture. Bacteriological examinations of all the aural discharges are urged since information of vital import is often disclosed.

Out of twenty-three cases seen by the writer, nine were of the distinct hemorrhagic type. In fourteen of the cases where the membrana tympani ruptured spontaneously, the pain, mastoid symptoms, and fever continued from twenty-four to sixty hours after an apparent free drainage had been established. In six of the cases the membrane was freely incised and in each the pain and other symptoms were promptly relieved.

The chief object in treating these cases is to rid the ear as far as possible of the bacteria and to inhibit their further development by destroying the pabulum and by keeping the propagatory surfaces dry. CLEMENS.

269. Patient, male, forty-five years of age, with an excellent family history, had, without apparent cause, a slight discharge from the left ear accompanied with a slight degree of pain. Recurrent attacks of earache, mastoid pain and tenderness occurred from time to time after this, which were generally relieved by a copious discharge of pus. Constant headache, loss of appetite, irregular temperature, gradual exhaustion, and a drowsy condition, which later changed to a deep stupor, soon followed. Examination showed the case to be much emaciated, face ashy color, pupils equally contracted, but no paralyses; the tympanum was filled with granulation tissue and pus; bulging of the posterior upper wall of the canal, and only the head of the malleus remained. Mastoidectomy was performed, at which typical miliary tubercles were found everywhere, associated with much loss of tissue. The autopsy failed to demonstrate the presence of tubercle in the lungs, spleen, kidneys, or mesenteric glands. No examination of the head was permitted, but scrapings from the middle ear and mastoid showed an abundance of tubercle bacilli present.

The interesting question arises, Was this a case of secondary tuberculosis in which the primary focus was overlooked, or a primary tuberculosis of the tympanum and mastoid with subsequent pyogenic infection? CLEMENS.

270. MCCAW thinks that mastoiditis following epidemics of influenza is consequent upon tympanic infection and is therefore a tympano-mastoiditis. Two varieties are recognized and described: The middle-ear inflammation in the first form is apt to develop during convalescence or immediately following the grippal attack, with slowly increasing pain and slight congestion of the drum without bulging. In from twelve to twenty-four hours the symptoms increase in severity, with tenderness of the mastoid and

bulging of the membrana flaccida. Paracentesis affords no relief and the rapid formation of pus is astounding. The second form occurs more frequently during the attack of influenza with sudden pain, hemorrhagic discharge, and mastoid tenderness. The clinical picture is similar to that of otitis hæmorrhagica externa, and impresses the writer with being a more severe condition than the former one, yet it yields more readily to treatment. Infection spreads rapidly, is usually virulent, and produces more cases of acute mastoiditis than scarlet fever, measles, or diphtheria. As an explanation for the development of these varieties of inflammation, he thinks that Perez's experiments with Pfeiffer's bacillus suggest that it does not cause an infection, but an intoxication, its pathogenicity being due to a toxin.

Treatment of the suppurative form is early and free paracentesis, warm douching every two hours, free catharsis, and if no relief occurs in thirty-six to forty-eight hours surgical interference should be employed. Treatment in the hemorrhagic form is rest, free catharsis, leeching in front of the tragus and over mastoid, and hot douching every two hours. In the writer's experience only about 5 % in this class go on to suppuration requiring ultimate operation. CLEMENS.

271. DENCH reports a unique case from which he draws the lesson that early operation on the mastoid is both justifiable and advisable. CLEMENS.

272. Acute middle-ear suppuration and inflammation, catarrh of the Eustachian tube, exudative middle-ear catarrh, and chronic middle-ear suppuration are treated in order. The monograph shows a wide personal experience and the author gives an excellent survey of the subject and its present clinical significance. ZIMMERMANN.

273. This is a report of the bacteriological examination of the discharge in five cases of otitis after measles. The streptococcus was found once, the staphylococcus albus in pure culture once. A bacillus found together with the streptococcus could not be cultivated, and a bacillus found associated with the staphylococcus was demonstrated by culture. It was a small bacterium with rounded ends which could not be classified amongst the groups described by Migula. DENKER.

274. The author has employed Schleich's local anæsthetic in eleven cases at Politzer's clinic, and thinks that in suitable cases

it can replace the ordinary methods of anæsthesia. 35–70 *ccm* of Schleich solution No. 1 were used. Complete composure and patience on the part of the patient were essential.

BRÜHL.

275. The author recommends the use of two square towels, of which one has a central slit 125 *cm.* long, while the other and smaller one has an elliptical opening which exactly embraces the field of operation. Both towels are placed so that the head, chest, and arms are covered. DENKER.

b.—CHRONIC PURULENT OTITIS.

276. **Hellat.** Chronic purulent otitis and its treatment. *Wratsch.*, 1901, No. 37.

277. **Cohn, Felix** (N. Y.). Experiences with the radical operation in acute and chronic suppuration. *Arch. f. Ohrenheilk.*, vol. liii., p. 100.

278. **Matte.** Attempts to secure adhesion of the drum membrane to the head of the stapes after operative treatment in chronic middle-ear suppuration. *Arch. f. Ohrenheilk.*, vol. liii., p. 96.

276. According to the author, chronic otorrhœa in Russia runs a much milder course than is observed in Western Europe, and specially in Germany. Cholesteatomata are rarely observed. In the course of an experience with aural diseases of eleven years the author has only observed two cases of the latter. He thinks the general cause of this is climatic. Perforations of Schrapnell's membrane also seem to be rare in Russia. Chronic exudates in the middle ear are scarce. The views of the author on the treatment of chronic otorrhœa and the radical operation furnish nothing new. SACHER.

277. The author believes that in those cases of acute middle-ear suppuration which are not healed by the ordinary Schwartze operation, especially those where there is caries of the walls of the aditus and of the ossicles, a radical operation is indicated. (Most operating otologists have probably had the same experience.—REVIEWER.) In a radical operation which became necessary two years after a simple mastoid operation, COHN observed complete bony regeneration of the wall of the sigmoid sulcus which had been removed during the first operation. To the Reviewer, the author's duration of healing, four to eight months, after radical operation, seems to be too long. DENKER.

278. In cases where the malleus and incus have been removed the author recommends a perforation of the drum membrane with

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the sinus was displaced forward, its wall diseased to a point 2 *cm* beyond the upper knee and below the bulb. The entire stretch was covered with a purulent greenish fœtid membrane. On palpation instead of pulsation a crepitation was heard. Incision was followed by evacuation of air and a number of broken-down, thrombosed masses. The sinus was firmly closed off above and down. The internal jugular was not thrombosed. It was doubly ligated and divided. Convalescence was prolonged, as on the third day an abscess formed, which opened externally at the site of the jugular wound, at the angle of the right jaw, with fever, rigors, and dysphagia. Recovery after nine weeks.

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SCHWENDT.

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is from the lower turbinals. Cauterization of the genital sites cures the dysmenorrhœa. The processes of labor and abortion may originate these neuralgic changes in the nose. On anæsthesia of the nasal genital zones labor pains are to a certain extent diminished. The author endeavors to explain this, for which his original article must be referred to. BRÜHL.

b.—METHODS OF EXAMINATION AND TREATMENT.

294. **Abeles.** Irrigation of the nose. *Bresgen's Sammlung zwanglosser Abhandlungen*, 1902.

295. **Hamm.** Treatment of chronic dry middle-ear catarrh in the pneumatic cabinet. *Muench. med. Wochenschr.*, 1902, No. 5.

296. **Suchanneck.** Forman and its use. *Fortschritte der Med.*, vol. xx., No. 3.

297. **Seifert.** The employment of forman as a snuff. *Deutsche Aerzlezeit.*, 1901, p. 8.

298. **Lubtinski.** On the treatment of the swollen lower turbinal in vasomotor rhinitis. *Berlin klin. Wochenschr.*, 1901, No. 52.

299. **Isatschik.** Turpentine oil as a hæmostatic. *Wojenno Medicinski Skurnal*, October, 1901.

300. **Goodale, J. L.** The correction of old lateral displacements of the nasal bones. *Boston Med. and Surg. Journ.*, Nov. 14, 1901.

301. **Gleitsmann, J. W.** On the use of the A. C. E. mixture in operations for adenoid vegetations. *Med. Record*, Oct. 2, 1901.

302. **Carter, H. W.** An adjustable automatic mouth gag. *Med. Record*, Oct. 10, 1901.

294. Nasal irrigations should only be applied in atrophic rhinitis, tertiary syphilis, and in certain cases of hemorrhage. Otherwise they should be replaced by local treatment and sprays. They are to be deprecated as prophylactic in infectious diseases, after endonasal interventions or as part of the daily toilet.

BRÜHL.

295. HAMM recommends the use of the pneumatic cabinet, because he had been able to achieve improvement in three out of eight cases previously treated without avail. It is well known that improvement takes place in certain catarrhal adhesive processes after the use of the pneumatic cabinet. BRÜHL.

296. Forman was introduced by WEDEKIND. On account of its sensitiveness to water it easily breaks up into its three components, formaldehyde, menthol, and acetic acid. While a slight amount of acetic acid does not irritate the respiratory organs, the vaso-contracting and anæsthetic action of the menthol with the antiseptic action of the formaldehyde can be employed in the form

of inhalations to abort inflammatory processes in the upper air passages. This can be done by the use of a nasal glass furnished by Ligner in Dresden. The simplest method is the inhalation of a lozenge of forman dissolved in warm water. For very busy people it suffices to introduce a piece of forman cotton as a nasal plug. It succeeds nearly always in bringing an acute coryza to a complete stop in the first twenty-four hours. It will be worth while to try this remedy in nervous coryza, hay-fever, and tonsillitis. SCHWENDT.

297. The author has had success in the treatment of incipient coryza, and recommends the use of the remedy, even in the advanced stages, to relieve the symptoms and possibly shorten the course. BRÜHL.

298. This is a new procedure to replace the galvano-caustic on the lower turbinals. It consists in injecting a 10 % solution of zinc chloride with a hypodermic syringe and a long needle which is introduced between the membrane and the bone and passed to the posterior end of the turbinate. This has been given the name of " the sclerogenic " method. MUELLER.

299. In a case of severe epistaxis in a patient suffering from malaria, the hemorrhage was repeatedly controlled by the introduction of a cotton plug soaked in turpentine. The author recalls that Billroth had recommended turpentine as a hæmostatic in 1883. SACHER.

300. With a pair of short-bladed straight scissors the septum is divided by a cut parallel to the external outline of the bridge of the nose and about 1 *cm* below it, into a narrow upper strip and a large inferior portion. The nasal bones are then freed from their lateral attachments to the nasal processes of the maxillary bone on both sides by a small saw, and by one or two blows with a mallet, on the convex side of the displacement, they are loosened from the fronto-nasal articulation. The nasal bones are thus lowered and the upper strip of the septum slides laterally upon the lower. The external splint for holding the parts in position consists of a broad metallic forehead plate, from which a finger-like projection extends downwards, and is adjusted to press upon the nasal bridge by two screws regulating it as in a carpenter's vice. M. TOEPLITZ.

301. GLEITSMANN relates how he operates for adenoids and hypertrophied tonsils under ethyl of bromide radically in one

sitting in the upright position. He has thus performed more than 500 operations, mostly without a mishap. He administers more of the drug than others, and has even reached 40 grammes.

M. TOEPLITZ.

302. CARTER's mouth gag lies flat against the cheek. The instrument can be adjusted to the individual face by a hinge joint permitting any degree of motion. In order to prevent the hinge from closing up and throwing the gag out of the mouth, a series of nine small cogs, into which a peg on the end of a spring lever would fit, was made upon the outer surface of either joint. The tooth-rests are made automatic for adaptation. The gag is opened and closed by the ratchet and spring attachment.

M. TOEPLITZ.

c.—TUMORS.

303. **Lichwitz.** Enlargement of the root of the nose by polyps in the nasal passages. *Arch. internat. d'otol.*, etc., vol. xiv., No. 6.

304. **Newcomb, Jas. E.** Four cases of tumors. *Med. News*, Oct. 26, 1901.

303. This is the report of a case of multiple myxo-fibromatous polypi recurring after removal, and causing dilatation of the root of the nose. The nasal bones were not pushed apart, but the dilatation took place between the nasal bone on one side and the ascending process of the superior maxilla. Removal of the polypi did not correct the deformity.

It can hardly be believed that the pressure from within caused the bones to spread apart, as the size of the polypoid growth was not sufficient for this. It is more likely that the change was pathological, secondary to a periostitic and osteitic process.

SCHWENDT.

304. Case I. *Osteosarcoma* of inferior turbinate in colored male, æt. forty-one. After removal of intranasal adhesion between right inferior turbinate and septum by the trephine, the subsequently formed mass was a spindle-celled osteosarcoma. Case II. True *papilloma* of nasal septum in male, æt. fifty-five. Case III. *Sarcoma* of branchial cleft in male, æt. sixty-five, the tumor occupying the right side of the pharynx, extending from opposite the last molar tooth upward and inward, to beyond the median line, downward to the floor of mouth, and backward into the pharynx. It was removed by Dr. Weir. Case IV. *Angiofibroma* of the nose in a male, æt. twenty-one, appeared as nasal

polyp, hanging from left middle turbinate and as a mass in the naso-pharynx, reaching back from the choanæ, blocking only the left. M. TOEPLITZ.

d.—OZÆNA.

305. **Perez. F.** Researches on the bacteriology of ozæna. Buenos Ayres, 1901.

306. **Hopmann.** Anomalies of the naso-pharynx as occurring in two cases of nasal suppuration with so-called reflex neurosis. *Münch. med. Wochenschr.*, 1901, No. 41.

305. The parasitic nature of ozæna is proven. The author, amongst many bacteria, found the cocco-bacillus, the Loewenberg-Abel bacillus, and a somewhat similar organism, which he calls the cocco-bacillus fœtidus ozænæ. It is differentiated by staining and cultural peculiarities, and is probably the cause of the disease, as it has the same specific odor, and in experimentation on rabbits produced the typical atrophy of the nasal membrane. The author has also demonstrated that the disease may be transmitted from dog to man and from man to man. A case is reported of the infection of a two-months-old child from its nurse, who was suffering from ozæna.

The author does not accept the opinion of many writers, that the disease depends on disease of the accessory sinuses. In conclusion, he gives a short résumé of the peculiarities of the cocco-bacillus and the Loewenberg-Abel.

ZIMMERMANN.

306. In both cases nasal suppuration existed in connection with congenital lengthening or diminution of the naso-pharynx. The author speaks of the shortness of the septum in ozæna, and believes it to be the result of the general atrophy of the nasal skeleton. SCHEIBE.

e.—DISEASES OF THE ACCESSORY CAVITIES.

307. **Alsen.** Treatment of chronic empyæma of the maxillary sinus, with description of our method of operating. *Arch. f. Laryngol.*, xii., No. 2.

308. **Baurowicz.** A case of mucocele of the ethmoid labyrinth with changes in the orbit. *Arch. f. Laryngol.*, xii., No. 2.

309. **Luc.** Mucocele of the frontal sinus and antrum of Highmore on the same side, associated with rarifying osseus lesions. *Arch. internat. d'otologie*, etc., vol. xiv., No. 5.

310. **Herzfeld.** Rhinogenic abscess of the frontal lobe of the brain healed by operation. *Berlin. klin. Wochenschr.*, 1901, No. 47.

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bulging of the membrana flaccida. Paracentesis affords no relief and the rapid formation of pus is astounding. The second form occurs more frequently during the attack of influenza with sudden pain, hemorrhagic discharge, and mastoid tenderness. The clinical picture is similar to that of otitis hæmorrhagica externa, and impresses the writer with being a more severe condition than the former one, yet it yields more readily to treatment. Infection spreads rapidly, is usually virulent, and produces more cases of acute mastoiditis than scarlet fever, measles, or diphtheria. As an explanation for the development of these varieties of inflammation, he thinks that Perez's experiments with Pfeiffer's bacillus suggest that it does not cause an infection, but an intoxication, its pathogenicity being due to a toxin.

Treatment of the suppurative form is early and free paracentesis, warm douching every two hours, free catharsis, and if no relief occurs in thirty-six to forty-eight hours surgical interference should be employed. Treatment in the hemorrhagic form is rest, free catharsis, leeching in front of the tragus and over mastoid, and hot douching every two hours. In the writer's experience only about 5 % in this class go on to suppuration requiring ultimate operation. CLEMENS.

271. DENCH reports a unique case from which he draws the lesson that early operation on the mastoid is both justifiable and advisable. CLEMENS.

272. Acute middle-ear suppuration and inflammation, catarrh of the Eustachian tube, exudative middle-ear catarrh, and chronic middle-ear suppuration are treated in order. The monograph shows a wide personal experience and the author gives an excellent survey of the subject and its present clinical significance. ZIMMERMANN.

273. This is a report of the bacteriological examination of the discharge in five cases of otitis after measles. The streptococcus was found once, the staphylococcus albus in pure culture once. A bacillus found together with the streptococcus could not be cultivated, and a bacillus found associated with the staphylococcus was demonstrated by culture. It was a small bacterium with rounded ends which could not be classified amongst the groups described by Migula. DENKER.

274. The author has employed Schleich's local anæsthetic in eleven cases at Politzer's clinic, and thinks that in suitable cases

it can replace the ordinary methods of anæsthesia. 35–70 *ccm* of Schleich solution No. 1 were used. Complete composure and patience on the part of the patient were essential.

BRÜHL.

275. The author recommends the use of two square towels, of which one has a central slit 125 *cm.* long, while the other and smaller one has an elliptical opening which exactly embraces the field of operation. Both towels are placed so that the head, chest, and arms are covered. DENKER.

b.—CHRONIC PURULENT OTITIS.

276. **Hellat.** Chronic purulent otitis and its treatment. *Wratsch.*, 1901, No. 37.

277. **Cohn, Felix** (N. Y.). Experiences with the radical operation in acute and chronic suppuration. *Arch. f. Ohrenheilk.*, vol. liii., p. 100.

278. **Matte.** Attempts to secure adhesion of the drum membrane to the head of the stapes after operative treatment in chronic middle-ear suppuration. *Arch. f. Ohrenheilk.*, vol. liii., p. 96.

276. According to the author, chronic otorrhœa in Russia runs a much milder course than is observed in Western Europe, and specially in Germany. Cholesteatomata are rarely observed. In the course of an experience with aural diseases of eleven years the author has only observed two cases of the latter. He thinks the general cause of this is climatic. Perforations of Schrapnell's membrane also seem to be rare in Russia. Chronic exudates in the middle ear are scarce. The views of the author on the treatment of chronic otorrhœa and the radical operation furnish nothing new. SACHER.

277. The author believes that in those cases of acute middle-ear suppuration which are not healed by the ordinary Schwartze operation, especially those where there is caries of the walls of the aditus and of the ossicles, a radical operation is indicated. (Most operating otologists have probably had the same experience.—REVIEWER.) In a radical operation which became necessary two years after a simple mastoid operation, COHN observed complete bony regeneration of the wall of the sigmoid sulcus which had been removed during the first operation. To the Reviewer, the author's duration of healing, four to eight months, after radical operation, seems to be too long. DENKER.

278. In cases where the malleus and incus have been removed the author recommends a perforation of the drum membrane with

layer of the "Hammerberg." The condition of the peripheric auditory organ is, unfortunately, not given. Should it not be said that this is a case of defect of the auditory nerve rather than of the acoustic nerve? The defect is not further described.

BRÜHL.

253. LUCAE is of the opinion that for diagnostic purposes it is not sufficient to determine whether the drum membrane and the malleus are mobile or whether they are able to carry out a great number of vibrations which the sound-conducting apparatus has to deal with in receiving sound. As the human eye is not able to follow the extraordinarily rapid vibrations of the drum membrane, the author has employed the otostroboscope method, which apparently retards the vibrations of the drum membrane so that they become visible. The otostroboscope consists of an ordinary reflector to which a rotating disc with ten holes is applied, permitting an intermittent observation of the vibrations of the drum membrane. The spaces between the openings must be so broad that they will completely cover the mirror opening in their rotation. In the anatomically normal drum membrane the most extensive vibrations take place in the upper and posterior quadrants, as well in the slow as in the rapid vibrations up to one thousand in a minute. In one case of definite sclerosis of the normal drum-membrane, vibrations which had been invisible were made apparent with this instrument. In another patient with hereditary deafness no vibrations were visible with the instrument. In a case of diplacusis which can only be the result of labyrinthine affection, fifteen hundred vibrations were detected in the drum membrane in their various phases by this aid of the otostroboscope. It is not possible from the mobility of the hammer to state what may be the function of the other ossicles. DENKER.

GENERAL.

a.—GENERAL SYMPTOMATOLOGY AND PATHOLOGY.

254. **Jürgens.** On the importance of the lymphatic glands surrounding the ear. *St. Petersburg Med. Jour.*, 1901, No. 41.

255. **Genta.** On tinnitus due to increased arterial tension. *Archivio Italiano di Otologia, Rhinologia e Laryngologia*, second year, No. 3.

256. **Zeroni.** On involvement of the temporal bone in acute osteomyelitis. *Arch. f. Ohrenheilk.*, vol. liii., p. 315.

257. **Lewin.** On the clinical and pathological condition of the auditory organ in genuine diphtheria (continued). *Arch. f. Ohrenheilk.*, vol. liii., p. 1.

258. **Habermann, J.** On the pathology of deaf-mutism and of the oval window. *Arch. f. Ohrenheilk.*, vol. liii., p. 52.

254. After describing the anatomy of the surrounding lymph glands, the author draws attention to the possibility of an inflamed gland, situated on the tip of the mastoid process or near there, being mistaken for mastoiditis, as it may produce the two important symptoms of mastoiditis — fever and tenderness of the mastoid process. SACHER.

255. GENTA describes that particular form of tinnitus which occurs in cases with an absolutely negative otoscopic and functional condition, appearing at first irregularly and later continuously, and characterized by a sibilant sound or a faint chirping. The electrical reaction of the auditory nerve is increased and occasionally there is slight diminution of perception for high tones. The author thinks this noise is to be distinguished from those which are synchronous with the contraction of a sound or diseased heart muscle. This tinnitus is due to circulatory disturbances in the labyrinth following contraction of the smaller vessels and anæmia of the labyrinth. Genta draws attention to the importance of this tinnitus which accompanies the beginning of increased arterial tension, and may sometimes be the only symptom of commencing arterial disease. RIMINI.

256. In a case of osteomyelitis in a boy thirteen years old, the author observed a purulent discharge from the auditory canal with an intact drum-membrane. The discharge emanated from a defect in the upper bony auditory canal as large as a pea. Post-mortem examination of the temporal bone showed that all the nutritive channels of the bone were unchanged. Spaces in the bone of the upper auditory canal were completely filled with leucocytes varying in size and shape of nuclei. This was consequently not a disease of the bone but an affection of the mucous membrane of the mastoid process without manifest inflammation of the tympanum. The author believes the disease was due to hæmatogenous infection, and thinks that a diagnosis of osteomyelitis of the temporal bone should be made with hesitancy, even if a general osteomyelitis be present and a focus appear in the temporal bone without preceding involvement of the tympanum. DENKER.

257. After describing the changes found in the Eustachian tube and drum membrane, tympanum, labyrinth, external auditory meatus, auditory nerve, and facial canal, the following conclusions

are drawn: Pharyngeal diphtheria does not produce the very severe complications which have been ascribed to it and may even be classed amongst those infectious diseases which are more or less favorable to the ear. In most diphtheritic otitides we have to deal in a pathological sense with an ordinary middle-ear inflammation. The extremely rare cases of true middle-ear diphtheria cause much more severe clinical symptoms and show more extensive anatomical changes than the ordinary middle-ear inflammations in ordinary pharyngeal diphtheria. Though the inner ear is in most cases normal the auditory nerve was found to be most frequently and most severely affected, particularly the hearing organ, so that not uncommonly extensive functional disturbances find their explanation in genuine diphtheria. The diphtheria otitides are usually the result of local manifestation of the diphtheria poison circulating in the blood and are not to be regarded as the result of the direct propagation of the disease through the Eustachian tube. DENKER.

258. The author reports on the examination of a case of deaf-mutism and on one of marked deafness, both of which were carefully observed during life. In the deaf-mute, a boy of thirteen, who succumbed to pulmonary tuberculosis, microscopical examination revealed no changes in the internal ear. A decided thickening of the lining membrane was present. The stapes was adherent to the niche of the oval window and to the Fallopian canal. The oval window was closed by a bony structure and the bone over the entire inner tympanic wall was thickened. These changes are all to be regarded as evidence of previous middle-ear suppuration. Functional examination showed complete deafness for voice, watch, and tuning-forks. If central disease of the auditory nerve can be excluded,—the brain showed no macroscopical changes,—this case shows that the bony occlusion of the round window and the fibrous anchylosis of the stapes are to be regarded as the cause of deafness.

In the second case, the niche of the round window was completely occluded by bone formation on the right side and partly so on the left. The niche of the oval window was not changed on the right side, but on the left was contracted by a hyperostosis of the posterior arm and the stapes was anchylosed to the bony wall. The mucous membrane of both sides was very much thickened. On the left, chronic purulent otitis media was present. There were no changes in the inner ear. Whispered voice was

heard, right, 15 *cm*, ordinary voice, 1.20 *m*; left, whisper 0, ordinary voice 3 *cm*, as well with the ear closed.

Both cases showed that the obliteration of the windows causes a decided deafness. That this, in bilateral cases, is sufficient to produce deaf-mutism appears doubtful to the author, because it is at variance with experience with children with congenital bilateral bony atresia of the auditory canal where there probably is no disturbance in the windows, since these children do not become deaf-mutes but learn to speak in the ordinary way.

DENKER.

b.—METHODS OF EXAMINATION AND TREATMENT.

259. **Koenig.** A new method of rendering direct massage to the ossicles by means of Lucae's pressure probe, less painful and more efficacious. *Arch. internat. d'otolog.*, vol. xiv., No. 5.

260. **Urbantschitsch.** On methodical hearing exercise. *Deutsche Klinik*, 1901.

259. The tip of Lucae's probe, which is supposed to be applied to the short process, is filled with paraffin, thus avoiding excoriations which are frequently caused by irritation; the process is also less painful. SCHWENDT.

260. The author discusses the applicability and value of methodical hearing exercises and relates a number of cases.

BRÜHL.

EXTERNAL EAR.

261. **Schwidop.** On the treatment of acquired atresia of the auditory canal. *Arch. f. Ohrenheilk.*, vol. liii., p. 41.

262. **Hoelscher.** Two cases of foreign body in the tympanic cavity. *Muenchener medicin. Woch.*, 1901, No. 42.

263. **Soplino Bentzen.** On the improvement of hearing by an artificial drum. *Hospitalstudie*, No. 49, 1901.

261. The author has followed the recommendation of Schwartze to cure cicatricial stenosis of the cartilaginous canal after traumatism by retracting the auricle and correcting the stenosis by plastic operation, and by removing concentric layers of bone of the posterior meatal wall. In spite of this the tendency to become smaller was present in the canal and the author had a rubber obturator fitted exactly into the external auditory canal. This was worn for four years. After that the lumen showed no tendency to closure. DENKER.

262. In both cases the foreign bodies had been forced into the

EDITORIAL NOTICE.

The **Archives of Otology** is a bi-monthly journal, published in annual volumes of about six hundred pages each, extensively illustrated with cuts in the text, half-tone text plates, and lithographic plates, many in colors. About three-quarters of the space is devoted to original papers, and the remaining quarter to a systematic report on the progress of otology, and to reports of societies, book reviews, and miscellaneous notes. The papers and reports are original, and only accepted with the understanding that they are to be published in this journal exclusively. The original papers in the English edition appear in the German (*Zeitschrift für Ohrenheilkunde*) either in full or in more or less abridged translations, and *vice versa*. Any subscriber who wishes to refer to the original text of a translated or abridged paper may, by applying to the editor, obtain a reprint which he is expected to return after perusal.

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ARCHIVES OF OTOLOGY.

A STUDY OF PAPUAN HEARING.

By CHARLES S. MYERS, M.A., M.D., Cambridge, England.

THESE experiments, of which a concise but necessarily incomplete summary is here attempted, were made during the visit of Dr. Haddon's expedition to Murray Island. They seem to be the first that have been conducted with a view to determining the auditory acuity, the highest audible tone, and the minimum perceptible difference of pitch among a primitive people. They will be published at full length in a forthcoming number (vol. ii., part 2), of the *Reports of the Cambridge Anthropological Expedition to Torres Strait* (University Press, Cambridge, England).

I.—*Acuity of Hearing.*

This is an exceedingly difficult subject of investigation anywhere, but in Murray Island the constant rustle of the palm-leaves and the beating of the surf on the shore aggravated the difficulty. After futile attempts with Politzer's hœrmesser, I had to lay it aside in favor of a stop-watch. A neighboring island, which I did not visit, proved quiet enough for my colleague, Dr. Rivers, to use the hœrmesser. He tells me that hardly any native there could hear as well as another member of the expedition, who was tested along with the islanders, and was found to have, for a European, only moderately acute hearing. My own inquiry was for the most part confined to children. Otorrhœa did not appear to be at all common during our stay on the island; moreover, I was anxious to avoid the possible interference of past sea-diving on adult auditory acuity. Either Dr. Rivers or I was always tested along with the islanders, the other of us holding the watch (a Runne's clock). External noises varied so much from day to day that I found it impossible to compare the results obtained from islanders on one day with those obtained from others on the next. Unless some fixed person was tested simultaneously with the natives, the experiments proved useless. In all, thirty natives were examined.

I cannot here quote the data on which my conclusions rest. The evidence appears to show that a considerable number of the islanders has slightly subnormal hearing, that in a small proportion (chiefly in those who have had otorrhœa after deep sea-diving) hearing is very decidedly defective, and that it is exceedingly rare to find an islander whose hearing equals the hyperacute hearing of many Europeans.

II.—*The Upper Limit of Pitch.*

In these experiments I used a Galton-whistle made by Hawksley, of Oxford Street, London. The diameter of the bore is 1 *mm*, and it is graduated according to the formula $n = \frac{v}{4l}$, where n is the number of vibrations, v the velocity of sound, l the variable length of the whistle. Reliance cannot, however, be placed on the accuracy of such estimations. From this cause, also from variations in tone-intensity and from the employment of different methods of tone-production, have arisen the surprisingly different results, varying from 18,432 vibr. (Zwaardemaker), to 40,960 vibr. (Preyer), which even recent observers have adduced from experiments on European ears.

Fortunately my own work is free from such sources of fallacy, as I used the same Galton-whistle under precisely the same conditions (save for negligeable differences of temperature), first among the Murray Islanders in the Torres Straits, and later among a number of country-folk in north-east Scotland. My results, therefore, are independent of an accurate determination of the note emitted by the whistle, and I am consequently able to compare the upper limit of hearing among a primitive and a civilized community, simply by observing the length of the whistle on each occasion when that limit was reached.

I hope shortly to estimate the pitch of my whistle by aid of a modified form of Kundt's dust figure-apparatus, but for the present it must suffice merely to state the whistle-length in millimetres. The figures in brackets give the number of subjects investigated within each age-group.

AGE.	WHISTLE-LENGTH AT UPPER LIMIT.	
	IN MURRAY ISL. (44)	IN SCOTLAND. (29)
- 9	2.23 (2)	1.97 (4)
10–19	2.26 (17)	1.99 (9)
20–29	2.91 (6)	2.23 (3)
30–39	3.16 (7)	2.70 (5)
40–49	3.72 (6)	2.79 (5)
50–59	4.60 (6)	3.98 (3)

Those whose hearing in both ears was defective, or in whom otoscopical examination revealed obvious signs of disease, are here excluded. The whistle was held at a metre's distance from the subject's ear. After a little practice, the india-rubber bulb, which I attached to the whistle, could be compressed so as to give time after time a blast of sufficiently constant force. Five determinations were made for each ear. Finally the average for the two ears (except in the rare cases of unilateral deafness) was taken. The interest shown by the Murray Islanders in these experiments was astonishingly great. The children, indeed, were considerably more attentive than their fellows in Scotland.

The results show that from childhood onwards a higher tone is heard by the European than by the Papuan ear. They also show, as Zwaardemaker has before found, that the range of hearing varies according to the age of the subjects investigated. It might be thought that sea-diving would have produced intra-aural changes unfavorable for a high upper limit of pitch. But Murray Island children showed the same inferiority as the adults: nor could islanders who had never dived hear a higher tone than the majority of those who had dived.

III.—*The Least Perceptible Difference of Pitch.*

Here again I am able to present a series of experiments, performed under strictly comparable conditions upon the children and adults of Murray Island and later on village school-children and people in northeast Scotland. I used two forks of the same pitch, c′ = 256. An arm of one of the forks was graduated and carried a sliding metal clamp which could be screwed fast to the arm at any desired position; by this means its pitch could be made to differ by relatively small or great amounts from that of the other fork. Before applying the forks successively to the ear of the subject (who sat with his back towards me), I took care always to listen to them first myself, so as to be sure that the intensity of the sounds did not materially vary. Each fork was applied to the ear for about two seconds. The interval between the withdrawal of the first and the presentation of the second fork was likewise about two seconds, during which the second fork was being struck. The subject was then asked which of the two forks was the higher, or whether he thought they were of the same pitch. After a short preliminary explanation of the general procedure, I began the experiment by presenting an interval so large that the subject could not fail to appreciate it. Next I rapidly and roughly arrived at an interval which was too small for his correct appreciation. I then worked gradually towards the threshold from a point which was clearly above it. Having reached and passed below this threshold, I gradually increased the interval between the forks again, until once more I arrived at the point of just perceptible pitch-difference. I applied the two forks five times for each position of the clamp, and was not satisfied that the subject had correctly appreciated the given interval unless he had given at least four successively correct judgments at the corresponding position of the clamp.

When later I came to determine the vibration-frequencies of the tones of the variable fork, Mr. G. T. Bennett, of Emmanuel College, Cambridge, kindly gave me the benefit of his considerable practice in beat-counting. From a mathematical study of our results, he has no doubt that they are to a sufficient approximation correct.

The general education of the Murray Island children was not very different from that in a British village school. They were all taught to sing European airs in class-time, and they did so with remarkably exact intonation. The table shows that of the eleven children examined five could

Correctly appreciating a difference of.	11 Papuan children.	15 European children.	20 Papuan adults.	18 European adults.
1 vibr. per sec.	0	0	0	0 (2 *m*)
2 " "	0	0	0	2 (1 *m*)
3 " "	1	2	0	0
4 " "	0	0	1	2 (2 *m*)
6 " "	1	1	0	1
7 " "	0	3	1	2 (1 *m*)
9 " "	2	2	2	0
12 " "	0	2	0	0
14 " "	2	1	2	0
16 " "	2	1	9	3
19 " "	3	3	4	2
22 " "	0	0	1	0

not discriminate between two successive tones less than sixteen vibrations per seconds apart; in other words, five could not appreciate an interval less than an untempered semitone. Of the fifteen European children, on the other hand, only four required so large a pitch-difference. The results given by the adult islanders are not so comparable with those obtained in Scotland. They had received no European musical education in childhood. While the school-children were wont to sing European rather than Papuan airs, the adults were limited almost wholly to native music, save for the hymns they had learned to sing (!) in church. Now if third- and quarter-tone music is so widely spread among primitive people, as has sometimes been stated, we might expect them to show a highly refined ability of distinguishing tone-differences. Instead, we find that no less than fourteen of the twenty adult islanders examined fail with intervals less than the semi-tone. The eighteen European adults include six who played a musical instrument; of these three had had valuable practice in tuning the violin, and one the violoncello. They are separately accounted for in brackets accompanied by the letter *m*, but at most only one or two of them could be termed "highly musical." In Murray Island there were neither stringed nor wind instruments. Several of the islanders examined, however, claimed to be composers of native songs.

Both in Murray Island and in Scotland I have interesting records of the different and often considerable effects of practice, obtained by experimenting on the same subject on two, three, or even four separate occasions. I thus obtained over twenty-five hundred judgments in Murray Island alone. Sometimes the constant, sometimes the variable fork was first sounded, in order to determine the possible influence of the order of presentation. I hope that these results will have special interest when compared with the work of Martin and Müller (*Zur Analyse der Unterschiedsempfindlichkeit*, Leipzig, 1899), who investigated the subject so far as the judgment of different weights was concerned. I do not, however, propose to publish further data here. They will appear later in the above-mentioned volume of the Expedition Reports.

ON THE VALUE OF ELECTROLYSIS IN THE EUSTACHIAN TUBE.

By NORVAL H. PIERCE, M.D.

SINCE 1839 electrolysis has been used by Crussel, Tripier, Mallez, Brenner, Clymer, Rockwell, Newman, and others in the treatment of strictures of the urethra, the rectum, the œsophagus, the nasal duct, and, latterly, of the Eustachian tube. Its employment in tubal disease has gained fresh impetus since the publication of Duel's paper in 1897,[1] though his efforts, as he himself discovered, were anticipated by Cumberbatch and Steavenson,[2] who published a series of seven cases so treated in 1888. The honor of first using electrolysis in the Eustachian tube does not belong to these gentlemen, however. Steavenson, in a note to the editor of *The Lancet* (December 8, 1888), acknowledges the priority of Mercie,[3] Miot,[4] Baratoux,[5] all of whom published papers on this subject in 1884. Robert Newman,[6] in a paper published in 1898, mentions using electrolysis in the Eustachian tube in December, 1894, and refers to the work done in this direction by Mercier and Garricon-Desarines[7] and published in 1884. By substituting a gold bougie for the more or less cumbersome electrodes of his predecessors, Duel greatly improved instrumentation.

Since Duel's papers appeared, several other otologists have published their results, some of which were remarkable for their brilliancy and others not quite so much so. In the discussions which followed the reading of these papers, too, a great dissimilarity of ideas was expressed as to the worth of the procedure. In order to estimate the efficacy of the electrical bougie in the treatment of tubal disease and the removal of those pathological conditions which might be connected with diminished audition and tinnitus, the writer subjected twenty-one cases during the past twelve months to this mode of treatment.

The electrical current was taken from the Edison street circuit of 110 volts, and led through a Victor shunt-controller. From fifteen to thirty volts were necessary to obtain from two to five milliamperes with the negative pole attached to the Eustachian bougie, while the positive pole in contact with the sponge electrode was held in the hand opposite to the tube operated on. The wrist-clamp, devised by Wendell C. Phillips for connecting the positive electrode with the wrist, may well be recommended, as annoying variations of the current may be caused by inconstant pressure when the sponge is held in the hand. The gold electric bougies, made by Meyrowitz, were employed. Contacts lasted from three to ten minutes. Length of contacts and strength of current varied according to the electrical resistance of the patient and the resistance offered to the passage of the electrode in the tube and the subjective sensations of the patient. Both the plain rubber catheter and the silver catheter were used. The silver catheter insulated by means of rubber tissue is more easily kept clean and more readily adapted by bending, to the peculiar topography of each case, than the rubber catheter. The procedure was nearly always carried on under cocain, all active inflammatory processes having been first allayed and the strictest cleanliness observed.

A brief review of the tuba auditiva will not only refresh memory, but may explain certain points observed in the use of the electrical bougie in the tube, which have been otherwise interpreted or understood. In its passage from the tympanum to the post-nasal space, the tube pursues a course from before, downwards and inwards (medial) obliquely backwards, upwards, and outwards (lateral). The axis of the tube forms with the axis of the external auditory canal, an angle of 150°; with the septum narium, an angle of 45° to 50°; and with the horizontal plane of the head, an angle of 30°. Its tympanal ostium is situate 2.5 *cm* higher, and 1.6

to 1.8 *cm*[8] further posterior than its opening in the post-nasal space. It is composed of two portions, a membrano-cartilaginous and an osseous portion, which join at a more or less obtuse angle. This part of the canal is the most constricted, and is, therefore, called the isthmus. From this point the calibre of the canal gradually but continuously increases toward both the pharyngeal and tympanal ostia, where it reaches its greatest diameters. The measurements of the tube must be maintained in the memory of one using the bougie. Its length, as given by different authors, varies from 34 to 44 *mm*, or circa in minimum 34.4 *mm*, of which three-quarters, or about 24 *mm*, belongs to the membrano-cartilaginous portion, and one-third, or 12 *mm*, to the osseous. Therefore the isthmus, or the most constricted part of the tube, at which the osseous and membrano-cartilaginous portions join at a more or less acute angle, lies 24 to 28 *mm* from the ostium pharyngeum; it has a horizontal diameter of 2 to 4.5 *mm*, while its longitudinal diameter is less than 1 *mm*.[9] The ostium pharyngeum has a longitudinal diameter of 9 *mm*,[10] and a horizontal of 5 *mm*. The ostium tympanicum has a longitudinal diameter of about 4.5 *mm* and a horizontal of 3.3 *mm*. The surface is slightly spiral, so that the anterior and outer wall of the cartilaginous portion becomes the inferior wall of the osseous portion, and the posterior inner wall becomes the superior.[8]

The relationship of the mesial wall of the osseous portion to the carotid is most important, inasmuch as only a thin layer of bone separates the two, and in this dehiscences are occasionally found[11]—facts not to be forgotten by those who use wire bougies in this region. The mucosa of the tube is continuous from that of the pharynx, and, in the region of the ostium pharyngeum and for a short distance inwards, is loose, vascular, and lies in large folds which tend to disappear toward the isthmus. These folds form a prominence on the floor of the tube near the pharyngeal opening, which acts as a valve to close the tube when in a state of rest. The part making up the floor is richly supplied with mucous and follicular glands; with these, in the middle of the cartilaginous portion, lymphoid follicles are found in such abundance, especially in children, as to warrant the name of "tubal tonsil."[12] The mucosa of the osseous portion more closely resembles that of the tympanum, and at or near the isthmus is thin and closely adherent to the bone; as it approaches the ostium tympanicum it becomes thicker and contains tubular glands.

Anomalies of direction have been observed in both the osseous and cartilaginous portions of the tube. Voltolini[13] mentions acute bendings of the osseous portion, and according to Schwartze[14] these anomalies are not of infrequent occurrence. Anomalies of lumen may be due to congenital or acquired pathological changes. Moos[15] relates the case of a deaf-mute with osseous obliteration of the tympanum, in which the opening of the tube admitted only the point of a needle. Toynbee[16] mentions as one of the causes of diminished lumen, the protrusion of the osseous walls; and the same author reports a case in which an enlarged carotid canal so encroached on the tube that only a bristle could with difficulty be passed through. Zuckerkandl[17] instances an abnormally spacious canal for the tensor tympani muscle encroaching on the lumen of the tube. The same author mentions the frequent occurrence of clavate projections at the ostium tympanicum which diminish the lumen of the tube. Congenital narrowing of the ostium pharyngeum has been observed by Urbantschitsch and others. Acquired stricture of the tube may be due to pressure from without its walls, or to disease of the mucosa or submucous tissue, such as occurs in the course of an acute or chronic catarrhal inflammation.[18] Such inflammations may lead to adhesions between the walls of the tubes, which may completely or incompletely destroy its patulency, or they lead to the formation of strands or threads of tissue reaching from one wall to the other and binding them more or less closely together. Inflammation of the submucous connective tissue most frequently leads to stricture at the isthmus, but an inflammatory exudate unorganized, or organized in the pars membrano-cartilaginea, may by interfering with circulation, produce passive congestion of the rest of the tube and of the cavum tympani.

In contradistinction to these commonly accepted views, Siebenmann[19] and Bezold,[20] speaking in a symposium on the treatment of tubal disease, declared they had never, in an enormous number of sections, observed stenosis of the Eustachian tube occurring anywhere but at the pharyngeal or tympanic openings of the tube.

In order to get this paper within the time limits, I shall be unable to read the case histories of the twenty cases, but will give a terse résumé which will answer all practical purposes.

Ten were in the class of oto-sclerosis, or rarefaction of the labyrinthine capsule. Eight were catarrhal. Of the remaining two, one was due to disease of the nervo-muscular apparatus of the tube; the other was one of almost complete obliteration of the membranous portion, due to syphilis.

All the cases had been treated by other methods by myself, before treatment was begun with the electrical bougie. Before beginning with the electrical treatment, all the tubes were explored by means of a celluloid bougie (Urbantschitsch's). In six of the cases of oto-sclerosis, the bougie was arrested at about the isthmus. In two of these six cases, the electrical bougie passed through the osseous portion after the fourth seance. They were all treated for two months, at intervals of a week, with catheterization every other day. In none was audition improved to a noteworthy extent, nor were the entotic sounds diminished. The tuning-fork tests for upper and lower limit, remained unchanged.

In six of the eight cases of catarrhal disease, the bougie was arrested from 4 to 23 *mm* from the pharyngeal opening. In five of them, after four months' treatment, the electrical bougie failed to pass further than the isthmus, or a few millimetres beyond. In two cases in which the bougie passed directly into the middle ear, there were extensive adhesions between the tympanic membrane and the promontory. In none of these cases was there any improvement—that is, further than the improvement gained by the other methods of treatment previously pursued, nor was there any alteration in the adhesions. The case of syphilitic stenosis remained unchanged.

In only two of the twenty cases could any results be ascribed to the electrical bougie. These were both cases of subacute disease with recurrent attacks of defective audition and tinnitus with diminishing intervals. In these cases there were, in all probability, soft infiltrations in the membrano-cartilaginous tube near the isthmus. In both of them the benefit to audition and the subjective symptoms was marked, immediate, and lasting, and these results were obtained after the usual methods of injection—the catheter, inflation, and massage—had ceased to benefit. Occasionally, in other cases, marked improvement to audition was observed immediately after the application of the electrode; that is to say, whereas the patient could hear a whisper at but a few inches before the use of the electrical bougie, immediately thereafter, a whisper could be heard at as many feet. But we cannot ascribe this to the influence of the electricity, inasmuch as we occasionally observe as great improvement following the use of the ordinary celluloid bougie. The explanation of this phenomenon is difficult, but probably takes place by way of reflex stimulation of the nervous apparatus of the ear."

In illustration of how one may be led to erroneous conclusions as to the value of electrolysis when used in this particular region permit me to introduce a case which came to my notice not long since.

A. F., æt. thirty-six, merchant, residing in a town in central Illinois. He complained of diminished audition and tinnitus in the left ear. No pain, no discharge.

Status præsens.—Weber left.

R +
A′ + 50
− 151a
Va 9 ft.

Otoscopy. — *Mt* ham-colored, otherwise negative. Urbantschitsch's bougie No. 3 arrested 2.6 *cm* from pharyngeal opening, which prolonged manipulation failed to pass farther.

Auscultation immediately thereafter gave evidence that the tube was fairly patulous, and of the presence of tenacious mucus. After inflation, hearing distance for whisper was increased to twenty feet. On the following day, bougie No. 4 passed to the tympanum without difficulty.

The case illustrates:

(*a*) that the bougie was arrested by the vertex of the angle of the tube, by a natural projection into its lumen, or by one of those minute fissures or depressions mentioned by Zuckerkandl[22];

(*b*) that there was no stricture;

(*c*) that had the electrical bougie been employed, its passage might have been ascribed to the influence of the electrical current.

It has been said that the use of the electrical bougie is accompanied by less pain than accompanies the use of the ordinary bougie; I have not found this so. On the contrary, I regard the electrical bougie as more painful. The use of the wire bougie in the Eustachian tube is not without danger. Several instances of acute otitis media following the use of the electrical bougie have come to my notice, one, at least, which necessitated an external operation for inflammation in the mastoid cells. There have been two instances where the electrical bougie was broken off in the tube, and when last heard of, the patients were carrying around the remains of the bougie in their tubes.[23] When we remember the relationship between the carotid artery and the tube, and when we further recollect that dehiscences in the bony wall are not of infrequent occurrence, we must realize that accidents of a very unpleasant nature may take place through wounding the carotid by the sharp end of a metal bougie.

Conclusions:

1. In otosclerotic disease, electrolysis is useless.

2. In the great majority of cases of catarrhal disease, it has no advantages over other methods of treatment.

3. In a certain few cases where there is probably a soft exudate near the isthmus, it may be regarded as of some value.

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ACUTE EMPYEMA OF FRONTAL SINUS — OPERATION — DEATH.

By Dr. VON WILD, Frankfurt, Germany.

Translated by Dr. Arnold Knapp.

A perfectly healthy young woman, nineteen years of age, was taken suddenly ill, on June 4th, with coryza and severe headache. The family history is fair. She had apparently never been ill beyond occasional colds in the head and indefinite headache. There had never been an abnormal discharge from the nose, nor had the nose been occluded. The sense of smell was not affected. The headache complicating the coryza was localized from the very beginning to the left frontal region, and occasionally was experienced in the occiput.

On June 5th, the headache became so severe that the patient was forced to go to bed, and the temperature rose to 39°. On the following day the fever and the headache persisted, and vomiting set in. In the evening I saw the patient for the first time. She complained of severe left-sided frontal headache; sensorium free; pulse frequent and regular; no rigidity of the neck, and no retraction of the abdomen; pressure on the left supraorbital nerve very painful. Transillumination of the frontal sinuses shows that the left is somewhat smaller than the right, but the light reaction is the same on both sides. The left nose is occluded. There is slight discharge. Beyond redness and swelling of the mucous membrane, there are no signs of prolonged suppuration. The naso-pharynx is normal. The swollen middle turbinate is pressed against the septum. A slight amount of whitish-yellow discharge appears at the infundibulum. The probe is admitted for a short distance, but could not be introduced into the frontal sinus. After cocaine the swelling decreased, and a free discharge of pus appeared, and the nose filled with matter every time the patient sat up. The relief was immediate. The severe headache disappeared rapidly. The following night the patient's condition was better.

On June 7th the temperature had fallen to 37.8°. The pulse was slower. General condition good. No headache. Some pain remained in occiput. No signs of a general disturbance. The spleen not enlarged. Free discharge of pus. No vomiting. In the evening high fever began, which persisted on the following morning, June 8th. The patient had vomited twice during the night, and was restless. The spleen is now distinctly enlarged. Pulse 120 and regular. Increased occipital pain. No rigidity of the neck, but lateral movements are somewhat painful. Sensorium perfectly free. In the afternoon at two patient became delirious, wanted to get out of bed, and did not recognize her surroundings. Left mydriasis. At five o'clock the left frontal sinus was opened. Preceding this, the left upper eyelid had become œdematous. Patient was delirious.

Operation.—The frontal sinus was freely exposed by removing the entire anterior wall with an osteoplastic flap. As soon as the chisel had entered the cavity, yellowish-green odorless pus was evacuated under moderate pressure. The cavity was found completely filled with pus. The lining mucous membrane was separated from its bony support, and was collected in a bunch in the centre of the cavity, except at the inner and upper corner, where it was adherent and covered with small soft granulations. It was thickened, infiltrated, and discolored. The cavity was curetted, and a defect in the bony wall was looked for, but the bone in no place appeared rough, and seemed everywhere perfectly healthy. It was impossible to pass a probe into the nose. In the middle of the posterior wall a quadrilateral window about 1½ *cm* was made. The dura was not discolored, but seemed very tense. On incising, the surface of the brain protruded, but no cerebro-spinal fluid escaped. The brain surface was shiny and without pulsation. The pia was not thickened. Incisions were made in various directions with negative results. The operation had no influence on the condition of the patient. Coma set in. A high continuous fever with high pulse rate and increased respiration persisted.

On the 10th multiple petechial hemorrhages appeared at the ankles. Death on June 11th. No autopsy.

This case, though incomplete, presents a number of interesting features. A previously healthy girl dies within seven days from the effects of inflammation of the frontal sinus. The suppuration is unquestionably an acute one. Not only the symptoms, but the rhinoscopic condition and the findings at operation speak for this. In addition to the change in the mucous membrane, which was found infiltrated, bunched together, and detached, the condition of the bone is of importance, as it appeared healthy to the eye and to the probe. Killian says that in acute frontal sinus affections, which run a rapid course and lead to intracranial complications, this unchanged condition of the bone is the usual one, as the time is too short for perforation to take place. On the other hand, in thirty cases of chronic frontal sinusitis with intracranial complications, changes were found in the cerebral wall in twenty-five. The tension of the purulent contents and its high virulence are responsible for the fatal infection. That the pus was evacuated under considerable pressure is proof of the copious discharge which followed the exposure of the infundibular ostium of the frontal duct. It is remarkable to observe that the discharge which set in on the third day and continued through the disease, to a certain extent relieved the subjective and objective symptoms, but did not prevent the progress of the disease.

Death followed from meningitis and general infection. The diagnosis of meningitis, without autopsy, rests on the oculomotor paralysis in combination with vomiting, delirium, deep coma, and increased cerebral pressure. The enlarged spleen and subcutaneous hemorrhages indicate the general infection. The infection of the meninges as well as of the general circulation took place through the agency of the small osseous veins with or without sinus thrombosis. This path of infection has lately been automatically confirmed by Hinsberg.

The operation was undertaken notwithstanding the meningeal symptoms, as it was possible that these symptoms were caused by a reactive serous exudation, circumscribed meningitis, or an extradural abscess. Accordingly we felt compelled not only to expose the frontal sinus, but also to explore the cranial cavity. The operation was done too late. The fall in temperature, the improvement in symptoms, and the good general condition of the preceding day seemed to warrant the delay. In another case I should be inclined to operate earlier. The method of removing the anterior wall by an osteoplastic flap proved to be an excellent one, and enabled us to explore the posterior wall with facility. The transillumination as a diagnostic aid was a failure, yet it showed us the extent and shape of the frontal cavity, which served us in making the bone flap.

In 1900, Killian had collected eight cases of acute sinus suppuration with intracranial complications. Of these eight cases very few have run such a fulminant course as the above described one and the case of Huquenin, 1882. The latter case is the only one which Kuhnt, in 1895, could find as an example that acute conditions of the nose and frontal sinus might lead to a fatal meningitis.

STATISTICAL REPORT ON THE RESULT OF THE EXAMINATION OF A SECOND SERIES OF DEAF-MUTES.

(THIRD SUPPLEMENT TO THE HEARING POWER OF DEAF-MUTES.)

BY PROF. F. BEZOLD, MUNICH.

(*With Plate IX. of Vol. XXXVI. of the German Edition.*)

Abstract by H. KNAPP.

THE further experience derived from his regular service as attendant aurist to a deaf-mute institution has strengthened in the author the conviction that an aurist should be connected with every one of these schools. Apart from opportunities for scientific research in various ways, the requirements for treatment will justify it abundantly.

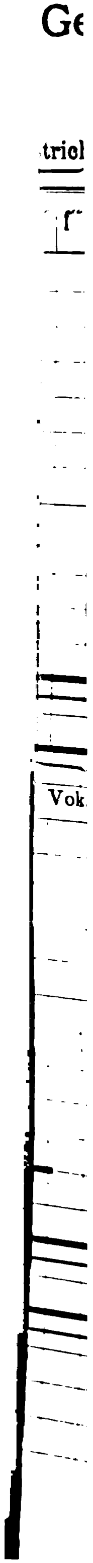
First we must not forget that the chief contingent of deaf-mutes in these institutions still suffer from diseases of the ear and its adnexa, chiefly from recurrent middle-ear suppurations requiring the aurist's care.

Secondly, the exact examination of the hearing function will have to determine of which kind and degree of education the pupil is capable. Upon the remnants of hearing and their position in the scale, as well as the auditory acuteness, especially when the duration of perception is examined with the continuous-tone series, depends the pupil's capacity of learning to speak.

One hundred and eighteen deaf-mutes were examined, of which 28% were totally deaf, 15% had only one island of hearing left, 6% had tone gaps, *i. e.*, interruptions in the series of tones they had preserved, and a greater number had larger or smaller tone defects in all parts of the scale. Their variety is recorded in great detail, with tables and explanatory remarks. The objective changes found in examination of the different parts of the organ, membrana tymp., etc., are treated with the same painstaking thoroughness. Disturbances of equilibrium, vertigo, unbalance, and nystagmus could be produced by long turning in only 16% of the totally deaf, but in over 80% in the partially deaf. To learn to understand speech, the perception of tones from b^1 to g^2 is absolutely necessary, as is evident from the statistical proofs presented in tables and elaborate explanations. In this respect the position of the vowels and consonants is very important. It is of interest to know that according to the investigations of Oscar Wolff, Donders, Helmholtz, and of A. Herrmann and Marage, the vowels and most of the consonants lie within this interval.

Plate IX. illustrates the narrowest tone intervals for the vowels and consonants which Bezold has found in his examinations of deaf-mutes. For the comprehension of speech the duration of hearing has proved more important than the range of tone perception. The knowledge of both is the most reliable guide in selecting those pupils that promise the best results from instruction in audible speech. Still more important than the range of audition is the smallest amplitude of vibration (tone intensity) that is perceived at the expiration of the range of audition. Bezold recommends to educate the deaf-mutes in two separate institutions, the one for those where there is no prospect of learning to speak, the other for those where the examination of their hearing capacity proves their chances to be encouraging.

The editor is sorry that our space limit does not permit a full translation of this, the third article of Bezold on this subject in these ARCHIVES. His researches in this line are exceedingly interesting and suggestive. They have been proved fundamental also in a kindred field, psychology, furnishing biological data of the brain functions, of which we may mention two recorded in the present article, namely (1) a modification of Helmholtz's theory of tone sensations by



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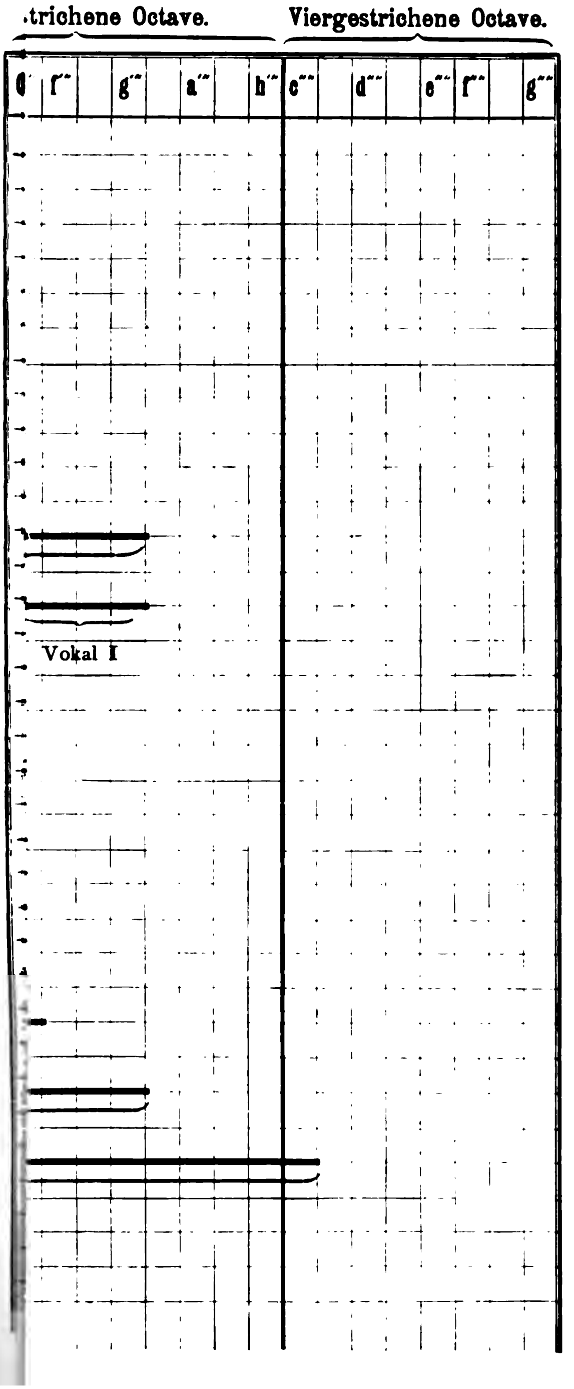

VERLAG VON J. F. BERGMANN, WIESBADEN.

Ebbinghaus (in his *Grundzüge der Psychologie*, 1897), and (2) a communication of Liepmann, who reckons one of Bezold's patients among the few well-authenticated cases of word deafness, calling it an example of Lichtheim's "subcortical sensory aphasia" (see Liepmann, *Psychiatrische Untersuchungen*, herausgegeben von Wernicke, Sept. 7–8). Bezold himself accepts both these cases as not fully conclusive.

ON DISEASES OF THE EAR IN HYSTERICAL SUBJECTS.

(REMARKS MADE DURING A DISCUSSION UPON HYSTERIA.)

BY DR. VOSS, RIGA.

Translated and Abridged by Dr. JULIUS WOLFF, New York.

AS assistant in the general hospital in Riga I was brought in contact with many severe forms of hysteria and was greatly impressed by the manifold ways in which this malady shows itself. At that time I saw the following case:

I.

A female visitor to one of the patients was taken with an hysterical attack. A part of her previous history, obtained from her physician, was to the effect that one morning she had noticed an ill-smelling discharge from her left ear, which had come on suddenly without previous pain. She was right; there was a foul-smelling fluid in the left ear, which on examination proved to be a mixture of fæces and urine that she had poured into her ear.

An analogous case was observed by me some years ago:

II.

This was an elderly married lady of the best society who belonged to a degenerated family, being hysterical herself. She complained of severe pains in the left ear, tinnitus, and marked deafness. Opposed to this was the statement of her husband, made immediately before, during her absence, who said his wife was so nervous that she was annoyed by the rustling of a newspaper which he was reading two rooms distant. Examination was entirely negative. Some years before I was consulted by the same patient on account of a copious discharge from one ear, which was said to have begun during the night and abundant traces of which were shown to me upon the pillow.

I found the external meatus dry, without any dried up secretion, the membrane pale and shining, and hearing excellent. On several more occasions she came to me with other hysterical complaints referred to her ears.

We have here, on the one hand, a plain woman of the poorer class, and, on the other hand, a lady of the best society, who both professed to a physician to be suffering from an ailment that did not exist. The cause for this was in each case the same, namely, hysteria. Both cases furthermore resemble each other in that the intended deception was so awkwardly practised that the disclosure, or, in other words, the diagnosis, was very simple to make, for inspection alone sufficed to establish the falsity of the statements. These coarse deceptions on the part of hysterical subjects are, indeed, well known, so I will only refer to a case of Haug, an hysterical woman who plugged both her ears with pebbles in order to be able to say that she was entirely deaf and suffered great pain.

III.

A similar example was the case of a young lady of seventeen years who complained for some time of difficulty in breathing through her nose. She readily assented to my suggestion to cauterize the moderately hypertrophied inferior turbinated bodies. No sooner was the electric circuit closed than she fell into a faint that had the appearance of an hysterical attack. This made me inquire more closely into her history for evidence of hysteria, but the patient denied ever having had any previous ailment. Her family physician, however, informed me that she had frequently had severe hysterical seizures. The treatment used for the nasal trouble was therefore an entirely indifferent one, although with each slight cold the patient desired that the turbinates be cauterized. When this was refused she exaggerated her symptoms, claiming the occlusion of the nose was intolerable, although she freely blew through the nose when told to remove some mucus that was supposed to interfere with the examination. She did not appreciate that thereby she was betraying herself. Two years later she suffered from eczema and furunculosis of the external meatus on each side, which were accompanied by an hyperæsthesia of the skin as far as the clavicle on one side and below the breast on the other. The suggestion to open her mastoid quickly caused this hyperæsthesia to disappear.

An interesting feature of this case, apart from the awkward manœuvre to simulate an obstruction of the nose, was the fact that the patient dissimulated her hysteria, or carefully avoided making any statements concerning the same.

Thus the above history shows that the anamnesis obtained from the patient herself is not sufficient, as it may be incorrect in one particular or another. Whenever possible it should be obtained directly from the physician in charge or the family physician, before we decide upon an extended treatment.

IV.

In February, 1898, a mother brought her eleven-year-old son to me. One and a half years before, the boy had complained of his ear, and on account of a mild injection of the tympanic membrane the diagnosis otitis media had been made. Later other symptoms followed: headaches, disturbance of vision (monocular diplopia and narrowing of the field of vision), and a neurosis of the knee-joint, all hysterical in nature. When I saw the boy this time he was again thought by his mother to have an otitis media, there being complete deafness, severe pain, but only a very slight injection of the drumhead. All symptoms disappeared at once on my assurance that not only this ear trouble but also the former one had been of a purely nervous character.

There are two other points concerning simulation that must be touched upon, which may be of importance in determining the treatment in any given case, namely false temperatures and hemorrhages.

In regard to the former, I do not refer to the mere statements of the patient that there is fever, but to temperatures actually measured, perhaps by the physician himself, with his own thermometer. Only very slight tricks on the part of the patient may cause the clinical thermometers now in general use to record very high temperatures. It is not possible to expose all these tricks of the patients, but I will mention just a few.

The extreme temperature of 109.4° was reached by a patient who used the thermometer to stir her coffee. Another used his burned-out pipe to warm the thermometer until he once reached 111° when he was detected. Strongly rubbing the thermometer upon the bedclothes may accomplish a similar result. A very simple method is merely to quickly tap the thermometer with the finger while it is in the axilla or the rectum, which will be effective provided the bulb end is horizontal with or higher than the other end.

Such deceptions are practised by patients desiring an operation, even though it be a dangerous one, if other means, such as claiming to have severe pain, have been of no avail.

The question of hemorrhages is sometimes a ticklish subject, when we are called upon to distinguish between spontaneous bleeding from an uninjured ear and simulation. The untrustworthy character of the statements of hysterical subjects is further evidenced by the two following striking examples.

V.

The history of this patient was given to me by Dr. Berkholz. She had complained of rheumatism, which was healed ; then a left-sided hemianopsia. Soon spontaneous hemorrhages occurred, first from the nose, then from the left ear and one eye. As they continually recurred the patient became weaker and weaker until she was taken into a clinic. Here daily hemorrhages kept up from the nose, left ear, and the caruncles of the eyes. No wounds of any account could be seen, and patient became still weaker. Then the urine became bloody, but the patient would not permit catheterization. She was chloroformed and pure urine drawn from the bladder. Examination of the vagina revealed a large darning needle, which was carefully returned to its hiding-place and the patient was transferred to a room where she was watched night and day. The hemorrhages continued, but she could not be caught in the act of producing them as she always drew the blanket over her head first. The needle was taken away and the hemorrhages ceased.

VI.

The next case was a woman who had suffered from some tuberculous process in her youth and was kyphotic. For the past ten years she has been deceiving one physician after another. Two of them were deceived by her bringing to them large amounts of blood which she asserted came from her mouth, simulating in one instance hemoptoë, in the other an hematemesis. Then she succeeded in having her mastoid opened by feigning a mastoiditis. Everything was found normal. A year later I find my friend in the hands of a physician trying to save her life during a hemorrhage after removal of a posterior turbinated tip. When I told him she was a simulant, he became indignant. Later she produced for his benefit the following symptoms: pain in the neck and outside of it, then a whole wreath of clear vesicles, later a conjunctivitis that would not cease, which turned out to be caused by small particles of lime which were always present in spite of frequent removal. Then came headaches with loss of hair in bunches, which she demonstrated by pulling out a handful. It was found to have been cut off close to the scalp. In the hands of other physicians she later passed successfully through the diagnosis of tuberculosis of the intestines and of the larynx; also a tracheotomy. A few weeks after I last saw her on the street she was brought into the hospital unconscious and died the next day. All organs were found healthy except for an emphysema and œdema of the lungs and a fatty liver, probably due to phosphorus poisoning.

This case ought from the beginning to have been in the hands of a single specialist, a neurologist. The more we treat such people locally the more their desire grows to impress us in our own domain. We encourage simulation by entering upon the treatment. The main thing is to make the diagnosis of hysterical simulation and leave the rest to the nerve specialist. It is our duty towards the patient.

Let us now pass to the pure functional neuroses that may be located in the ear. They can best be designated as sensory disturbances, divided into anæsthesia and hyperæsthesia of the sensory nerves on the one hand, and of the auditory nerve on the other.

Absolutely pure functional neuroses, without any discoverable disease of the ear at all, seem to be rare. This may be explained by the extreme frequency with which aural lesions are to be found and in the preference with which functional neuroses are located in such parts as have already attracted the attention of the individual. Therefore most cases which on hasty examination appear to be pure neuroses will, on closer examination, turn out to be mixed forms.

VII.

A young lady with severe hysteria was brought to me years ago. The ear could hardly be examined, for she drew her head away, claiming the speculum caused unbearable noises. Sensation of the skin was normal. Tuning-forks, vibrating so feebly that I could hardly hear them, were unbearably painful for her. Weber's test with forks c, c′, and c‴ produced the same result, while c″ was not heard at all, no matter how hard it was struck. Hearing of voice and watch more than normal.

This appeared at first like a pure case of acoustic hyperæsthesia, until examination with various forks revealed the tone-defect.

In cutaneous hyperæsthesia the pains are frequently exaggerated to such a degree that the diagnosis is quite plain. The slightest touch or the mere proximity of the finger to the ear causes the patient to draw away, although sometimes we may succeed, while his attention is taken up with something else to press real hard without causing pain. To the sensitiveness to touch there may be added spontaneous pain, or the latter may exist by itself and then we have otalgia or mastalgia. In these cases a wrong diagnosis may be of serious consequence in causing unnecessary surgical procedures.

VIII. AND IX.

These were two cases who complained of most intense otalgia and mastoid tenderness whereas examination of the ear showed normal conditions. In both the mastoid was opened on account of the pain, but no disease was found. The second case sacrificed her ear-drum and her hearing through the operation.

As examples of the direct causes that provoke such hyperæsthesias I adduce four cases.

X.

In the first of these a fall from a wagon, producing no discoverable injury to any part of the body, was followed by intense earache, fever (that was not measured by the physician himself), and disturbance in walking. The mastoid was opened and everything found normal.

XI.

A very young nurse had charge of a severe mastoid case that died of sinus thrombosis, and right after that of another small ear-patient. A week later she complained of intense earache, though the parts appeared normal. Reassurance did not improve her condition, but a dose of bromides and valerian did so very quickly.

XII.

In this case the provocation was a box on the ear, received by a nurse from a patient. She complained of severe pain, first in that ear, then in the other, and again in the first. At the same time sensibility of the skin on the upper half of the left side of the body was much diminished. In a short time the symptoms subsided. This case makes the impression of a pure traumatic neurosis, or rather hysteria brought to the surface by a traumatism.

XIII.

Very similar to the last was the case of a young governess who was struck on the ear with a thin kid glove by her pupil. The pains became intense and hearing was lost, but examination revealed no trace of inflammation or injury.

Two more cases of traumatic neurosis may be cited to serve as a text for the discussion of the treatment.

XIV.

A young lady of twenty-five years in stooping accidentally ran one branch of her spectacles into her right ear. She immediately became very deaf, not only on the right but also on the left ear; loud noises and giddy feeling in the head. Examination the same day showed a small injury to the roof of the meatus, but the membrane was intact and anæsthetic. The deafness on the left ear soon vanished, but that on the right persisted a long time; and now, as I think back, I cannot free myself from the belief that the fact that I continued to treat her contributed thereto. Several times I sent her to a nerve specialist, but she did not go. That my first diagnosis of a neurosis was correct was proved a year later, when she again came to me, completely deaf on both ears and with the "same terrible noises" in the right ear. And what was the cause this time? In a narrow street she had passed close to a pair of horses and one of them snapped at her. This time she believed my assurances that the trouble was merely due to fright and demanded no further treatment. The deafness gradually disappeared of its own accord.

XV.

A better result was obtained in the treatment of a young Russian woman who came to me in the greatest excitement. In a turbulent speech she stated that her whole career was threatened and ended with the statement that she had just become deaf from a blow on the ear. Inspection revealed a fresh rupture of the left membrane. Owing to the patient's excited condition I did not mention the same, but merely spoke of a small superficial injury that would heal in a few days. The next day she no longer mentioned her left ear, and on the third day was very much disgruntled because I still occluded it. This ear, she said, was entirely well, but the right one could not hear. For her excited condition I prescribed bromides and valerian and in two days she came to thank me, as she was feeling entirely well, though the perforation had not yet healed.

Besides the rupture of the left drum membrane there was in this case a traumatic neurosis of the right ear. I am firmly convinced that I would not have attained this favorable result if I had first lectured to her about the rent in the membrane. She would not after that have believed my statement that such openings heal without serious results.

In passing now to the therapy of these conditions I wish first to make mention of a fact well known in medical literature. In every volume of neurological periodicals you may read of cases in which, after an hysterical attack or some other inducing cause, deafness and aphasia remained, which after a longer or shorter time disappeared. And what has been the treatment? Almost never interference by specialists. From these facts we must conclude that pure functional neuroses of the ear will in many cases be cured if treated only according to the precepts of neurotherapy and not by specialists. I even go so far as to assert that it is our duty to transfer cases of this class to the neurologist. I consider all local treatment contra-indicated and believe that even frequent local examination may make still firmer the patient's conviction that there is local disease. More particularly still are operations upon the nose or of the ear contra-indicated, for thereby we only injure the patient.

Thus far I have spoken only of patients in whom no objective signs were to be found in the ear. I now come to a second group in which objective signs in the ear are visible, but can only be regarded as manifestations of the general neurosis. *Angioneurotic appearances* in the skin and mucous membranes are a well-known though unusual picture of hysteria. According to Gradenigo they appear as œdema, hyperæmia, and anæmia, hemorrhages and trophic disturbances. I therefore wish to draw attention to otoscopic pictures which may readily lead to wrong diagnoses and their consequences.

XVIII.

A nine-year-old boy suffered for three or four days from very severe pains in his left ear, so that he wailed night and day in spite of narcotics. There was no fever, the mastoid was tender, not swollen and its skin unchanged. Ear drum shining, darker gray than on the other side, not injected, not bulging. Hearing diminished.

I was struck by the active assiduity with which the boy, who had just then been moaning in bed, left the same and sat down to be examined. He was an only child with hereditary taint. The father died in an insane asylum and the mother—well, she will appear sufficiently in this history. The patient was taken into the hospital where for three days the pain and appearance of the drum remained the same. Believing that I was dealing with a serous otitis, I performed a paracentesis, but to my surprise found no exudate. The cut healed in twenty-four hours but there was no change in the condition. An ice-bag was applied, followed by improvement and then suddenly relapse into the former condition. The nurse now reported that the relapse was due to the following: the mother had been well pleased with the ice-bag because it drew out so large an amount of matter from the ear. When the nurse laughingly said that this was only melted ice-water, the dissatisfaction and aggravation immediately appeared, especially when the nurse or the physician entered the room. While listening at the closed door one could hear mother and son quietly conversing, even laughing. A nerve specialist was called who diagnosed hysteria and ordered the boy to leave the bed and exercise; and now the music began. We were called rough and heartless in presence of the boy, who asserted he could not walk and always fell to one side, invariably finding, however, a ready support on the cross-bar of a window without touching the glass. The assurance that the boy could be cured, but only if the mother went off on a trip, was answered by the coarsest invectives, directed against us.

XIX.

A woman of thirty, who had been suffering for a year from hysterical paraplegia, complained suddenly of severe pain in the left ear. Marked hyperæsthesia over mastoid; over the middle of its convexity a small sensitive nodule like a gland; membrane shining, not bulging, dark gray in color, mild radial injection. Hearing normal. When I percussed with my finger over the mastoid that was so very sensitive, the patient repeats monotonously the words: "Sehr ángenehm, sehr ángenehm, sehr ángenehn" [very pleasant], the accentuated syllable always coinciding with the tap. If a tap is omitted she simply says: "Sehr án—" and pauses till the percussion is continued. Simple reassurance caused the symptoms to disappear by the next day and the membrane was again pale as on the other side.

In both of these cases as in others that I have seen, the actual color of the membrane was still gray. But the injection may be so pronounced that the general impression will be that of red. In that case the lustre of the surface is also lost and the reflex gone. In still more marked cases the drum looks bright red and swollen as in acute otitis media just before perforation. The outlines of the hammer disappear and only the short process is visible.

XX.

A woman of forty-five years presented the appearance last described, together with severe otalgia. I treated her palliatively as a case of acute otitis media for three days, and, as the condition did not improve, performed paracentesis into a tympanic cavity containing only air. In twenty-four hours the incision closed, no secretion appearing on the occluding gauze, but the conditions were the same as before. I now emphatically stated that the trouble was only a nervous one and not an inflammation, and prescribed bromides and valerian. In twenty-four hours the membrane appeared normal and the pain was gone.

I was inclined to attribute the dark gray color of the membrane in the milder cases, and the marked injection of the severer ones, to hyperæmia of the tympanic mucous membrane. This, however, is not correct, for through the gaping incision in the drum I could make out a quite pale mucous membrane, anæmic rather than hyperæmic, covering the inner tympanic wall. The main injection, according to my observations, is only in the superficial vessels in the epidermal layer of the membrane. An injection of the mucous layer of the tympanic membrane seems to me improbable, for in that case the other tympanic vessels would likewise be injected.

After these experiences, gleaned from paracentesis in the cases under consideration, I have arrived at the conclusion *that the objective picture of acute otitis media may be a pure symptom of hysteria.*

XXI.

In the case of a young governess, her physician had diagnosed acute otitis media with pain, injection of the drumhead, and deafness, and performed a paracentesis without any discharge showing. Though the membrane became pale, mastoid tenderness supervened, and I was consulted. I found normal hearing, a dark gray drum, slight œdema over mastoid, and hypæsthesia of the surrounding skin when tested with a pin-point. I diagnosed hysteria, which opinion was confirmed by further investigation into the previous history and the subsequent course of the ailment.

In regard to the diagnosis of this class of cases, which, I believe, has not yet been described, I have the following remarks to make:

Above all, it is important to trace any existing hysteria or hereditary taint by a careful study of the patient's previous history. In Case XX. my failure to do so led me into a wrong diagnosis and the performance of a paracentesis. Since it is possible, however, for acute otitis media to occur in a patient who gives a history of hysteria or hereditary taint, it is necessary to add to the anamnesis proof of the actual presence of hysteria at the time. The disturbances in cutaneous sensation will serve as an aid in this.

The hyperæsthesia of the skin of the mastoid may in many cases extend diffusely over the whole process without there being any particular tenderness over the region of the antrum. It is especially important to find when this hyperæsthesia is not limited to the mastoid region, but extends beyond its boundaries, sometimes as far as the median line of the neck in front, or even to the breast. I have already pointed out that this hyperæsthetic zone is sometimes less sensitive on firm pressure than superficial touch.

In other cases there are pressure points, but I have never found them to correspond with the antrum or mastoid tip. These points of greatest sensitiveness are more apt to be over small nodules on the convexity of the mastoid process, or over the trunk of the occipital nerve where it pierces the muscles far behind the antrum, but the pain has not the character of a neuralgia of this nerve.

Anæsthesia, which, as I am told by neurologists, is a conspicuously frequent condition in these cases, is also not limited in its extent by the boundaries of the mastoid process. It may also be so variable that it can be present to-day, absent to-morrow, and again present a few days later. In several cases I was struck by the absolute painlessness of the paracentesis, and am inclined to attribute this to anæsthesia of the drum.

As regards the deafness, I noticed that in spite of the assertion that the ear could hear nothing, the head would be drawn away when a loudly vibrating tuning-fork was brought close to the ear unexpectedly. This test succeeds only once, however, for the head is not withdrawn the second time.

In testing bone-conduction the fork is not heard at all on the mastoid process, and in Weber's test it is lateralized either to the healthy side, or not at all. It is unusual to meet with the statement that the fork is also heard on the affected side. In no case was the fork heard persistently louder on the affected side, as in acute otitis media. The tube is always perfectly patent, and there are moist râles with inflation.

This brings me to the therapy, and I now again emphasize that operative procedures are contra-indicated. I have received the impression that those cases which are handed over to the neurologist take the most favorable — that is, the shortest course, whereas the longest course is taken by those which have already passed through several hands, especially if the subject of opening the mastoid has already been broached. The fate of the patient lies in the hands of the first physician consulted; if he makes the diagnosis correctly, quietly, and without wavering, the course will be a favorable one.

XXII.

The harmful effects that may follow even a paracentesis I saw in a man fifty-nine years of age. There was hyperæsthesia extending over the whole left side of the neck down to the clavicle; but if the patient's attention was drawn away, the sensitiveness was not present. The other symptoms also pointed towards hysteria, and I referred the patient to a neurologist, but instead he went to a well-known otologist. The latter performed paracentesis, and a discharge appeared—not immediately, however, but a few days later. The mastoid process became tender, and also had to be opened. Besides that, the patient underwent an eye operation and then demanded an intestinal operation. The latter was not performed, but the patient was sent home.

Inasmuch as the main purpose of this article is to safeguard hysterical subjects against operative interference, I will select from the very profuse literature on hysteria only those cases which pertain to painful affections of the mastoid process, because these most often lead to surgical intervention.[1]

A striking example of the craving of hysterical patients for operation is offered by the case of a seventeen-year-old girl with old double scarlet-fever otitis. As the latter did not yield to prolonged treatment, I suggested a radical operation, to which she readily consented. There was no history of hysteria. The operation of the right ear and the healing took a normal course, but the after-treatment lasted four months. During this time the patient complained of pain in the head, and demanded operation of the other ear. When she awoke from the narcosis of this operation she had a typical hysterical attack, and now the trouble began. She complained of increasing and unbearable headaches on the side last operated upon and of fever, measured by herself at home. Temperature was normal whenever measured by a physician. After four months the wound healed, but the complaints persisted, and occasionally there were moderate elevations of temperature. A neurologist who was consulted confirmed the diagnosis — hysteria, but admitted the possibility of a cerebral abscess. Although warned of the dangers of an operation, the patient insisted, and a trephining and exploration of the brain was performed, with a negative result. Healing uneventful. But the patient did not yet have enough and succeeded, during my absence, in having another trephining performed. Now she has been married for a number of years and is healthy.

I believe that in the foregoing case the long treatment, extending over one and one half years, and especially the operations, were the direct inducement to the outbreak of the hysteria to which the patient was predisposed. I have therefore come to the conclusion that when we have decided that an operation must be performed in an hysterical patient, it is all important not to describe the same as dangerous to life, or even at all dangerous, but to make the prognosis favorable in order not to burden the patient's mind any more than necessary.

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[1] Cases XXIII. to XXXVII. inclusive are taken by the author from literature to illustrate instances of ear operations performed on hysterical subjects.

J. W.

I now come to the last point, namely our present method of after-treatment of operations; I mean the custom of tamponing the wound which is still in general use. The long duration of these painful or at least sensitive manipulations makes them a source of torture for nervous people, and especially nervous children. Zaufal was first to omit unnecessary tamponing of the wound after acute mastoiditis, except in its lowermost portion, by suturing the wound, if there were no complications in the brain or sinus. The average period of healing in 87¾%, of the cases was 26⅓ days, which is a splendid result.

As regards the radical operation for chronic cases it is, indeed, our present custom to suture the wound, but we continue for months to tampon through the meatus. Zarniko has proposed to substitute for tamponing the complete filling of the cavity with boracic acid. Acting on this suggestion I have left the tampon out after the fifth day, nor did I put in boracic acid thereafter.

XXXIX.

A nineteen-years-old girl suffered since childhood from an intermitting discharge, following scarlet-fever otitis, and a radical operation was demanded and performed. Examination of the cutaneous sensation had resulted negatively. The antrum was found to be no larger than a pin-head. A cutaneous flap was made from the lower portion of the meatus, the posterior wound sutured, and a tampon inserted through the meatus. Change of dressing on the fifth day, removal of sutures, primary healing. There now was a complete hemianæsthesia of the body on the operated side, in other words, hysteria. Thereupon the tampon was removed from the ear and not renewed, but merely an outer dressing applied. This ear healed in one month without any secretion whatever, and the whole cavity was lined with delicate epithelium.

In this case the anæsthesia, which was certainly not present before, only appeared after the operation. I have mentioned the case mainly to show what results may be obtained without tamponade. Not one drop of discharge flowed from the external meatus, though, of course, touching the granulations with a little cotton revealed small traces of a muco-serous fluid.

This course was, to be sure, an exception, the rule being that there is a more or less abundant purulent secretion from the external meatus which is to be removed daily, or every few days, with some dry cotton on a carrier. No powder need be insufflated, protection being afforded by an outer sterile dressing. In the cases in which no fetid secretion existed before the operation, the secretion remains odorless; but, if it was fetid, daily irrigations through the auditory meatus should be made. Sometimes the odor remains to the end and ceases only when epidermization is completed.

Now, what is going on meanwhile in the tympanum, the antrum, and the meatus?

He who has for years been accustomed to tamponing finds a condition that seems to him horrible — granulations everywhere, no good survey of the parts as we are accustomed to in a wound held open by the tampon. The temptation ever exists to use the sharp spoon or curette or, at least, the nitrate-of-silver stick. But I must strenuously warn you against any such interference, for thereby you will spoil your good results. If you will once have the courage to watch quietly for a month or two, you will be surprised at the result. Slowly and gradually the granulations contract and are covered with epidermis in many places ere we suspect it.

At the end the auditory meatus will not show much more than the normal width. In the antrum the same process takes place — gradual epidermization and cicatrization. In the tympanum we find either that the mucous membrane is covered by epidermis, or that a delicate membrane has been newly formed just as in the old treatment.

A prime requisite for this favorable course is the free exposure of the aditus ad antrum, so that no adhesions will form. This is the only place in which, judging from my experience, a granulation is apt to remain when the rest of the cavity is healed over. In that case I simply remove it with a snare, and soon obtain cicatrization. Conducted in this way the after-treatment is made as painless as possible, and is readily borne by children as well as adults.

In briefly summarizing what I have dwelt upon in the foregoing, I conclude that:

1. *The objective picture of an acute otitis media may appear as a symptom of hysteria.*
2. *Pure functional neuroses of the ear should be treated, not by an otologist, but by a neurologist.*
3. *In these cases an absolute contra-indication exists against too much treatment, especially of the nose and pharynx.*
4. *The generally well-known craving of hysterical subjects for operations may also centre upon the ear (and probably also upon the nose).*
5. *Opening the mastoid process to relieve the mastalgia of hysterical patients is absolutely contra-indicated.*
6. *Our present method of after-treatment of radical operations with prolonged tamponing is not at all suitable for children or nervous and hysterical patients. After the fifth day the tampon is entirely superfluous and should be replaced by a simple outer dressing.*

THE INVOLVEMENT OF THE GASSERIAN GANGLION IN MIDDLE-EAR SUPPURATION.

BY DR. ROBERT HILGERMANN, BRESLAU.

Translated by Dr. ARNOLD KNAPP.

THE treatment of the intracranial complications following otitis has been furthered by the exact knowledge of the various preformed channels by which the inflammatory process extends from the middle-ear cavities to the skull. We know that certain paths are followed more frequently than others, and that they cause well-characterized symptoms. Again, we know that in the case of certain channels of infection definite forms of intracranial conditions are to be expected. During the past year a great deal of care and time has been spent on the study of these connecting paths, yet we find that some relations are not sufficiently explained. Among these is the way by which an inflammatory process extends from the middle ear to the region of the Gasserian ganglion, though von Troeltsch in 1868 drew attention to these relations, and they have been very recently compiled in a comprehensive manner by Koerner. It has been my privilege to examine cases, largely in the Royal University Clinic for Diseases of the Ear, Nose, and Throat, and in the private hospital of Professor Kuemmel, which may throw some light upon this subject.

It seems proper first to review the anatomical relations. According to F. Krause, the trunk of the V. nerve passes under the site of the attachment of the tentorium cerebelli and directly under the superior petrosal sinus through an aperture in the dura mater, which is always larger than the nerve itself and is more closely connected with it. From this aperture on for the remainder of its intracranial course, which is situated in the middle cranial fossa, all branches of the V. nerve are extradural; in other words, between the dura mater and the base of the skull. Near the apex of the petrous pyramid, on its upper and anterior surface, there is a depression (impressio trigemini) which is covered by the dura mater in the form of a tent, thus forming a confined space which extends anteriorly in the middle cranial fossa between the base of the skull and the dura mater. This is the cavity of Meckel, or of the semilunar ganglion. In this cavity the Gasserian ganglion may become affected by inflammatory processes in the interior of the petrous bone. A well-known path is one leading through the pneumatic spaces of the petrous bone. These pneumatic spaces, which in general are only to be found in the mastoid, may present an unusual development and may even occupy the entire pyramid. Merkel says that these petrous cells may be so extensive as to surround the labyrinth up to the aqueduct of the vestibule, and more than half the entire pyramid may be replaced by air cells.

Urbantschitsch has described the communications between these pneumatic cavities and the interior of the skull as follows: Near the tympanic ostium of the tube, sometimes in its upper half or somewhat farther back on the inner tympanic wall, there is frequently a small bony defect, which in one of my specimens presented a diameter of 2½*mm.* This opening leads into the pneumatic space surrounding the tympanum and the labyrinth, and extends to the apex of the pyramid. A bristle introduced in this defect may be passed to the apex of the pyramid and there it can be seen through a very thin bone. In some specimens this thin bony plate at the apex of the pyramid presented small defects, so that a direct communication existed. Fluid injected into the defect in the tympanic wall would appear in the cranial cavity at that point. Hence it seems probable that pus could follow the same path. Even if no defects are present, this very thin plate of bone surely can not offer much resistance, and the inflammation would then pass directly to the ganglion. The lower surface of the ganglion is not separated from the bone by the dura mater, but by a very thin periosteal connective-tissue layer.

The cases where extension has followed this path seemed to be extremely rare; I have been able to find only the following cases mentioned in literature.

I.—von Troeltsch reported a case of a woman who complained of regularly recurring attacks of fever, with severe shaking chills and headache. On admission patient was in the sixth month of pregnancy. Five days later a purulent discharge was discovered coming from the right ear which was said to have existed for three years. The number of chills increased; the entire oral region became œdematous; the pupils were unequal. On the second day the patient became delirious; a normal labor took place on the thirteenth; the symptoms about the ear increased in severity, and under the picture of pyæmic infection death ensued after two days.

At autopsy there were purulent phlebitis of the transverse sinus, two extradural abscesses on the anterior surface of the petrous bone, and a perforation of the bone at this site; subperiosteal abscess on the mastoid process. The drum was thickened but intact. The tegmen tympani presented a defect in the roof of the antrum. At this point there was a quantity of yellow inspissated pus, and the mucous membrane was directly in contact with very much thickened dura. The antrum was full of pus; a fistula led from the attic through the upper meatal wall. The pyramid is normal in its middle part, but at the apex, about the situation of the Gasserian ganglion and the cavernous sinus, it is discolored.

The author thinks that the purulent inflammation of the Gasserian ganglion originated in the otitis, and claimed to have observed two similar cases.

II.—Ostmann has reported a case of middle-ear suppuration which died shortly after the mastoid had been opened. The cause for this fatal termination is believed to have been an extension of the pus along the Gasserian ganglion, as the autopsy revealed pus up to the apex of the petrous pyramid, where it had broken through and surrounded the ganglion.

The following case was observed in our clinic.

III.—Acute relapse of a healed middle-ear suppuration; disease of the mastoid process; perforation of the pus through the tympanic cells to the fovea for the trigeminal ganglion; meningitis.

W. M., thirteen years old, had, after measles, at age of four, otorrhœa from the left ear. During the last two weeks the otorrhœa was accompanied by headache, fever, vomiting, vertigo, with a tendency to fall to the right. On admission T. 39.8°, P. 88 to 100. The head is held more or less in a fixed position, though all movements are passively possible without pain. The anterior and posterior margins of the mastoid are very tender, as well as the insertion of the sterno-mastoid muscle; the canal is filled with fœtid pus, which accumulates rapidly.

Operation.—The antrum was opened and the mastoid cells were found filled with pus; the antrum contained pus and granulations; the tegmen seemed solid; the sinus and the dura of the middle fossa exposed; both appeared healthy, though the bone on the posterior surface of the antrum appeared softened. The sinus was incised, but contained fluid blood. Distinct rigidity of the neck continued; high fever and other marked meningeal symptoms ensued, and the patient died on the following afternoon.

Autopsy.—Extensive meningitis; sinus free. On examining the apex of the pyramid, the Gasserian ganglion was found bathed in pus. On retracting the dura in the region of the fovea, the dura could not be recognized as such, but was replaced by soft granulations. At this place a very delicate connective-tissue band, perhaps a nerve, perforated the bone and passed into a cavity mentioned below. The ossicles were normal and imbedded in hypertrophied mucous membrane. From the floor of the hypotympanic recess a system of pneumatic spaces filled with pus and granulations passed inward between the jugular fossa and labyrinth, then proceeded inward and forward to the apex of the pyramid. The previously mentioned thin area of bone at the fovea trigemini corresponded to the inner wall of a large air cell which surrounded the carotid canal and was filled with pus.

Evidently the inflammation passed along the delicate fibrous band to the cavity of the Gasserian ganglion.

In the following case of Buerkner it is uncertain whether the semilunar ganglion was affected in a similar manner.

IV.—Patient had suffered from left otorrhœa for eight days and facial paralysis for three days. There was a perforation in the posterior and lower quadrant, with granulations, which were removed. The symptoms were thereby relieved, but after a month the pain returned in the left ear with greater severity, and the discharge was diminished. Then nystagmus, paralysis of the VI. nerve, neuralgia — all branches of the V.,— vomiting, and stupor set in; death ensued from exhaustion.

At autopsy an adhesion was found of the anterior extremity of the left cerebellar lobe to the posterior surface of the petrous bone directly behind the passage of the V. nerve. At the site of the adhesion a grayish mass extended along the V. nerve to the pons, and between the pons and the cerebellum to the medulla. On incising the pons directly beneath the exit of the V. nerve an abscess as large as a cherry was exposed. On the upper margin of the petrous bone there were three carious places. The petrous bone posterior to the antrum and above the sigmoid bulb showed a number of yellowish-white masses, situated in cavities with smooth walls which communicated with the skull at the aforementioned carious places and were connected with the vestibule. The grayish mass just described extended, together with the nerve, into the internal ear.

It seems that in this case the infection passed along the V. nerve and produced one of those rare abscesses of the pons. It is, however, difficult to say how the infection extended from the original cholesteatomatous suppuration to the semilunar ganglion. The cholesteatoma had unquestionably invaded the labyrinth, and it cannot be excluded that the extension took place along this route.

The following case of Schwartze is even more indefinite.

V.—The patient was admitted to the clinic on July 11th on account of severe pain in the ear. Nothing abnormal was found beyond a slight hyperæmia of the drum. Paracentesis evacuated no pus. After a slight improvement death suddenly took place on July 17th.

Autopsy.—Diffuse meningitis. The drum and tympanum were found normal. There was a puriform collection between the dura and the petrous bone near the Gasserian ganglion. The cochlea, the vestibule, and the semicircular canal contained a sero-purulent fluid.

In this case we can at least assume with certainty that the meninges became infected by way of the cavity of Meckel. The author emphasizes the fact that there was no collection of pus in the internal auditory canal, but that the trigeminal ganglion was imbedded in pus. It is impossible to say whether the pneumatic spaces in the petrous spaces were an agent in this case, as no special examination seems to have been made. In these cases it is necessary to think of a mode of infection of the semilunar ganglion, which is more complicated, and has not been described, namely, the transmission through the carotid and cavernous sinuses. The otitis media may lead to a phlebitis of the smaller blood-vessels which pass from the tympanum through the carotico-tympanic canaliculi to the venous plexus surrounding the carotid.

According to Krause the Gasserian ganglion rests with its anterior part not directly upon bone, but on the outer wall of the cavernous sinus. The first branch of the V. nerve is intimately associated with this venous channel, as it together with the III. and IV. nerves are situated in the reduplication of the dura mater, which forms the outer and upper wall of the sinus. We have found that a part of the ganglion itself is very closely related to the wall of the cavernous sinus, hence it seems likely that the ganglion and generally the root of the first branch and its surrounding loose connective tissue can become infected from the sinus. In fact this appears to occur quite frequently. Phlebitis of the cavernous sinus with circumscribed or diffuse meningitis has often been observed. In these cases it has generally been assumed that the infection of the subdural space has followed directly from the upper wall of the cavernous sinus.

This upper wall, however, is very thick and scarcely suited to transmit an inflammatory process. In our case (No. VI.) this upper wall of the sinus was not changed, but the delicate connective tissue was purulently infiltrated, suggesting the possibility of a transmission to the meninges. Hence we must regard the infection of the ganglion as a middle step between the phlebitis of the sinus and the meningitis. The following two cases from our clinic seem to support this possibility. I was unable to find analogous cases in literature.

VI.--**Old chronic otitis media. After radical operation meningitis with orbital symptoms on the opposite side. Meningitis from diseases of the V. nerve.** (*From the carotid and cavernous sinuses?*)

A. K., nineteen years old, was suddenly taken with pain in the right ear four years ago, which ceased with the onset of the suppuration. The pain recurred from time to time and lately attacks of vertigo were noted. Treatment seemed to be without result. Granulations were repeatedly removed with the curette. Radical operation was done on *Oct. 7th.* The bone was found sclerosed. The antrum was small and deep. The hammer was found imbedded in granulations. The external semicircular canal was not diseased.

Shortly after the operation patient complained of vertigo. On the following day twitching of the facial set in with nystagmus on looking to the left. Severe headache. Very slow pulse, occasionally intermitting. T. 38.2°.

Oct. 8th.—Nystagmus and vertigo less. P. 62, intermitting at every fifth beat. Pain and rigidity of the neck and Kernig's contracture noted. The dressing was changed, and in addition to some pus in the wound there was a discolored area present on the external semicircular canal. T. 37.8°. Very restless and pain in the back during the night.

Oct. 9th.—T. 38.7°, P. 64. The left pupil dilated. On sitting up, vertigo and rigidity of the neck. Another operation was undertaken and the wall of the middle cranial fossa was found affected. Puncture of the posterior cranial fossa proved negative, while that of the middle fossa withdrew a quantity of meningeal fluid. An attempt to enter the vestibule miscarried, as the sinus was displaced anteriorly and the antrum was very narrow. The external and posterior canals were opened and the labyrinth fluid escaped. During the operation the facial nerve twitched repeatedly. Soon after, left ptosis, photophobia. Great restlessness. Pain in the neck; then stupor. T. 39.3°.

Oct. 10th.—The left eyeball is somewhat restricted in its movements upward and outward. The other symptoms continue. T. 38.6° to 38.7°, P. 102 to 122.

Oct. 11th.—Great restlessness and delirium. Eye-grounds normal. Right-sided VI. nerve paralysis. The diagnosis of meningitis at the base seemed assured, so that no further operation could be undertaken. Pulse rose to 142.

Oct. 12th.—Ptosis and chemosis, left. Epistaxis. Blood is vomited. Beginning optic neuritis. Condition remained about the same, and patient died on Oct. 15th.

Autopsy.—Extensive meningitis. Transverse sinus contains normal blood. The cavernous sinus and its connecting venous vessels of the dura are infiltrated with pus. On exposing the Gasserian ganglion at the apex of the petrous bone, pus escaped. The left orbital roof is removed and pus is seen to have extended along the sheath of the III. and VI. nerves in the orbital tissue.

Below this membranous diaphragm, which appears like a secondary drum, and below the tensor tympani, there is a blind cavity which forms the external margin of the tube. This contains thickened pus. There is another blind cavity between this and the lowest part of the Eustachian canal, which is not connected with the tympanum, but communicates by a small opening with the other cavity. As no pus was found in the internal auditory meatus, it must be assumed that the infection travelled to the meninges not by way of the labyrinth, but through the tympanic cells. The part of the cavernous sinus adjoining the sixth nerve was found to be thrombosed and the wall of the carotid presented some unusual features. Though the lower and anterior part of the wall has its normal color, the posterior and upper is a dark bluish-red. This peculiarity is probably due to the fact that it is this portion of the cartoid canal which adjoins the diverticula previously mentioned. Microscopically the vessels of the carotid sinus presented a great number of hyaline thrombi, but no purulent infiltration. The wall of the carotid itself was normal. The cochlea and semicircular canals contained a quantity of recent purulent exudate. The auditory nerve showed a small-celled infiltration.

In this case repeated attacks of vertigo occurred. After the operation symptoms appeared which made the diagnosis between meningitis and cerebellar abscess uncertain. At the subsequent operations no cerebellar abscess was found. The attempt to open the vestibule did not succeed. Meningitis soon became evident.

The autopsy revealed a phlebitis of the sinus on the diseased side, which had extended to the healthy side, and had affected the orbital veins accompanying the VI. and III. nerves. The place where the infection of the sinus took place could not be made out, though it seems most probable that the inflammation extended along the carotid sinus. Without question the concussion from the chiselling of the very hard bone acted powerfully in the transmission of the inflammatory process. This would explain the meningitis appearing directly after operation.

In the following case the path of the inflammatory agent also could not be determined with certainty.

VII.—**Acute otitis with protracted mastoid disease; extensive operation on the mastoid, with wounding of the dura; death from meningitis forty-eight hours later; thrombus of the carotid sinus; meningitis transmitted by the cavernous sinus and the cavity of Meckel.**

G. A., fifty-eight years old, has suffered from pain in the left side of face for six weeks. Three weeks ago left-sided otorrhœa set in and paracentesis was performed three times. The pain became more severe, and on admission to the hospital on August 10th, the patient appeared very ill. T. 37.6°. The left canal filled with pus; the drum reddened and protruding in the posterior segment, where pus, under pressure, issued forth from a small perforation. The mastoid tip was sensitive.

Operation, September 11th.—The mastoid cells contained granulations. After removing the bone near the sinus, a large quantity of thick pus suddenly escaped, but there was no extradural abscess. The entire mastoid was diseased and had to be removed, and on completion everything below the antrum had been removed. The posterior surface of the petrous bone was then removed to explore the cerebellar dura. In doing this the dura was injured and an entirely normal brain surface protruded. Temperature in the evening, 37.2° ; pulse, 90. The patient complain of slight pain and some pressure in the occiput. During the night an unusual irregularity of the pulse was noted. September 12th, at half past five P. M., T. 38.8° ; pulse, very irregular; vomiting ; headache ; no rigidity of neck ; patient was composed. In the course of the evening, the typical picture of meningitis developed and death followed on the following morning.

Autopsy.—Diffuse meningitis. The internal auditory canal is free from pus, but the ganglion is surrounded by quite a quantity. The dura is everywhere very thin. The accidental opening corresponds about to the opening of the aqueduct of the vestibule. There is no purulent collection at this point. About the fovea trigemini the bone presents a very dark red discoloration. The surface is everywhere intact. The tympanum appears filled with pus and swollen mucous membrane ; the ossicles are in place. At the inner angle the thickened mucous membrane extends right up to the carotid canal, at which point the wall of the latter is very thin and hyperæmic. It is impossible to say whether an actual defect existed. The carotid wall at this thin place shows a very distinct bluish color, as if the small vessels were dilated with blood. This change is continued on towards the brain, and extends along the posterior and upper walls up to the point corresponding to the anterior surface of the fovea trigemini. At this point, as has been noted before, the pyramid shows the very dark red coloring, which can not be brought into connection with the tympanum. As far as can be determined microscopically the internal ear seems healthy. Portions of the internal ear were examined microscopically, and the veins were found to contain hyaline thrombi, but no bacteria could be found.

The unusually rapid termination of this case after operation for acute otitis is very interesting. Within 24 hours the diagnosis of meningitis was evident. At autopsy the internal auditory canal was normal, but the Gasserian ganglion was found imbedded in pus, so that it seems probable that the latter was the transmitter of the infection. This transmission could have taken place through disease of the pneumatic petrous cells, as in Case V. We found the bone in this region discolored, but no direct communication through pneumatic cells could be established. The carotid sinus was found to be situated unusually near to the floor of the tympanum, and exhibited a striking bluish color. We were not able to find a distinct perforation from the tympanum into the carotid canal, though the presence of the thrombi in the veins is to be regarded with suspicion. Unfortunately the condition of the cavernous sinus was not noted. It cannot be denied that the injury to the dura may have been the cause of the meningitis, except for the fact that we know that such consequences are extremely rare, and we are inclined to believe that in our case the meningitis existed before the operation.

It has been shown that under certain circumstances the operation for otitis media may be followed by meningitis through transmission of the semilunar ganglion in a most complicated manner. This fact is not new, but it does not seem to have received much attention.

Clinical symptoms, in all of our cases pointing to an involvement of the V. nerve, were absent, though it cannot be said that these were especially looked for. It is not improbable that we can frequently find anæsthesias or neuralgias which may give us a clue, and the question then presents itself, What can be done in the way of treatment in these cases? If the symptoms show an involvement of the V. nerve, the Gasserian ganglion could be extirpated and the cavity of Meckel could be exposed according to the method of Hartley-Krause. Perhaps it may be possible in this way to prevent the onset of fatal meningitis. However, such a procedure is very difficult, and before we are entitled to try it a certain number of dubious points must be explained; our own cases are not convincing. It would be important to determine by autopsies whether a collection of pus in the cavity of Meckel, as we have presupposed, could secondarily infect the arachnoid sac, or whether the retention of pus in this cavity is simply a secondary factor in an inflammation of the subdural space.

Another point is to determine the part which labyrinth disease plays in these cases. In one of our cases and in the case of Schwartze and Buerkner the labyrinth was surely involved. In the case of von Troeltsch and in our cases Nos.

III. and IV. a microscopical examination was not made and labyrinth disease cannot be excluded.

We hope that this paper, necessarily incomplete, may serve that greater attention be paid to the points in future at autopsies.

THE INMATES OF THE WESTPHALIAN PROVINCIAL DEAF-MUTE INSTITUTE, AT SOEST, PRUSSIA.

BY DR. A. DENKER, OF HAGEN.

(*With Plate X. of Vol. XXXVI. of the German Edition.*)

Abstract by Dr. H. KNAPP.

THIS extensive report is made according to the Bezold methods of examination, with the practical object to determine which of the pupils were suitable to be taught by the ear, and which by the method of articulation.

1. **Etiology of the difficulty.** The number of the pupils was 64; 38 boys, 26 girls. In 16 the difficulty was congenital, in 32 acquired, in 16 doubtful. Meningitis (cerebrospinal, spasms) was present in 16 cases, in most of the others otitis purulenta media et interna could be recognized. A table of all the cases presents the results of the objective examination of the auditory organ; adenoid vegetations were found in 29 cases.

2. **Perception of pure tones** (illustrated by Plate X.). 25 (40 %) were perfectly deaf in both ears.

Hearing rests:

I. *Islands* up to 2½ octaves, in 31 ears among 21 persons.

II. *Tone gaps*, 7 ears in 7 persons.

III. *Large defects* in the *upper part* of the scale, with preservation of the whole lower-tone part, 4 ears in 3 persons.

IV. *Larger defects* in both *upper-* and *lower-tone limits*, 4 in 3 persons.

V. *Large defects* in lower-tone limits, with slight sinking of the upper limit, 3 ears in 3 persons.

VI. Small defects in both upper and lower limits, 15 ears in 10 persons.

The result was that 16 pupils possessed (in one or both ears) sufficient hearing capacity to be suitable for improved instruction.

3. The examination for the **perception of the human voice** with unclamped forks was carried out in detail. By those pupils that could hear one or all words, the faculty of hearing tones from b^1 to g^2 was present.

[The gray stripe in the plate, that interval which, according to Bezold, is never wanting in deaf-mutes that learn to speak by the ear.]

The examination has demonstrated that the perception of all tones is more or less diminished in every case where the tone perception of a part of the scale is totally obliterated, showing that in such cases the destructive process extended to all parts of the inner ear that are concerned in audition.

4. The **objective examination** prompts the author energetically to plead for the necessity of treating the chronic suppurations with all the means of modern otology.

5. **Disturbances of equilibrium**, including nystagmus, were noticed in all degrees of deafness; absent in total deafness.

6. **Pathological conditions of the eyes** do not show any connection with deafness.

7. The "**aphasic pupil of the Institute,**" eleven years old, had been admitted to the Deaf-mute Institute because he could not speak, though his hearing was normal. His mother died of morphinism, which was fully developed when he was born. No pathological condition found, except adenoids in a moderate degree. The functional examination showed good perception of all the tones of the scale, also normal duration of perception. He understands whispered words and speaks them correctly, but somewhat hesitatingly and laboriously. He, therefore, does not suffer from sensory aphasia, where the patient hears what is

Partielltauben.

ruppe III.			Gruppe IV		
2.	3.	4.	1.	2.	3.

spoken, yet can neither understand nor repeat it, but he suffers from *atactic* or *motor aphasia*, where a central defect prevents the patient from speaking though he hears and understands well and has normal phonetic conditions. Owing to the articulation method, in which he had been trained the last four years, he repeats what he hears correctly, though awkwardly, in the deaf-mute speech.

The diagnosis of a defect in the left cerebral hemisphere was made more plausible by the presence of disturbances in the right extremities, both of which were somewhat paretic, and there were occasional spasms in the right arm. Agraphy and alexy are absent; the boy writes and speaks spontaneously. His brother and sisters, who all were born before the mother's sickness had developed, are perfectly healthy.

REPORT OF THE TRANSACTIONS OF THE NEW YORK OTOLOGICAL SOCIETY.

By Dr. ARNOLD KNAPP, Secretary.

MEETING OF MAY 27, 1902. THE VICE-PRESIDENT, DR. EMERSON, IN THE CHAIR.

Presentation of Patients.

Dr. **Wilson** presented a patient whom he had seen on February 1st, and who had suffered from **otorrhœa** for six months. Next seen March 22d, when he had pain in the left ear, cerebral symptoms, temperature went to 104°, became somewhat comatose, with stertorous breathing; could be roused, but answered "Yes" to all questions; occasional lightning-like involuntary contractions of facial muscles; eyes normal; no rigidity of neck; no paralysis nor mastoid symptoms. At 8 P. M. same day the left antrum was opened. Antrum found small and healthy. The dura over the external auditory canal was exposed to the extent of 2 x 1½ inches. It appeared healthy above, below seemed discolored. A crucial incision was made, letting out a slightly milky fluid with a few fine shreds in it. The inner membranes appeared semi-opaque, the opacities being thickest along the lines of blood-vessels. He regarded it as a case of purulent leptomeningitis, and thought the prognosis was very grave. The temperature, however, went to normal, the cerebral symptoms disappeared, and the patient recovered.

Dr. **Kipp** inquired what was the condition of the dura mater over the tegmen tympani.

Healthy. The route of affection was not discovered.

Dr. **Brandegee** asked whether the pus was examined bacteriologically.

Dr. WILSON replied that streptococci had been found in the discharge from ear a month before operation.

Dr. ARNOLD KNAPP inquired what the hearing was before operation.

Dr. WILSON said it was practically obliterated.

Dr. BERENS raised the question as to the propriety of operating on patients in a comatose condition.

Dr. KIPP thought we should not operate under any circumstances without consent. He also asked whether any change appeared in the meningeal condition in the after-treatment.

Dr. WILSON replied that the meninges became more opaque.

Presentation of Specimens.

Dr. TOEPLITZ presented a specimen of a **brain and temporal bone,** which he had removed at autopsy from a patient with the following history: The patient, a young woman, was first seen December, 1901, suffering from otorrhœa of seventeen years' standing after diphtheria. The aural condition was that of caries, or left middle ear, with cicatrix of right *Mt.* Five months later, owing to persistent headaches, it was decided to do a radical operation. The left mastoid was found sclerosed, and there was no antrum. On proceeding into the middle ear through the canal, facial twitching repeatedly occurred upon mere probing. The method of Stacke was followed, and the dura was accidentally exposed over the superior wall of the canal. After operation, the temperature did not rise above 100° during the first four days. The wound did not do well. There was considerable odor. The temperature rose on the fourth day slowly, to 103° on the seventh day, the pulse-rate to 100–110, respiration 20–22. Eyes normal, cerebration clear. On the ninth day the opening into the middle cerebral fossa was enlarged, and carious bone and granulations were removed. On the eleventh day the temperature went to 105°, with cerebral symptoms. An attack of facial erysipelas had set in, and was recognized on the eighth day. Dura bulged; it was incised on the thirteenth day, and a probe evacuated pus. At autopsy a purulent, diffuse lepto meningitis localized to the frontal lobe of the brain was found on the left side. The base of the temporo-sphenoidal lobe showed in its anterior half a certain amount of darkened disintegrated brain substance, and posteriorly a cavity which was recognized as a superficial abscess. Mastoid and post. wall of meatus removed.

Perforations leading into post. cerebral fossa. Opening 1⅛″ through the tegmen tympani leading into middle cerebral fossa. Fallopian canal in aditus exposed; cholesteatoma in middle ear; Pus oozed from oval window.

Dr. TOEPLITZ was inclined to regard the erysipelas (streptococcic infection) as the factor in the fatal termination, though he thought it was difficult to decide this point.

Dr. KIPP said he had had a case which died of meningitis complicated with erysipelas, where it had been impossible to determine which had caused death.

Dr. KENEFICK asked whether there was any complication from the kidneys. No.

Voluntary Contributions.

Dr. HARRIS related a case of **double mastoiditis with meningeal symptoms** in a woman of thirty-eight. When admitted, there was intense swelling of both canals, mastoids tender, temperature 102°. No pain. Tinnitus very marked, hearing much reduced, and a sense of pressure at the base of the brain was complained of. No history of previous ear trouble, though she had been treated by family physician for pulmonary tuberculosis. A broad paracentesis was performed, and ice-coils applied to the mastoids. The eyes were normal. Streptococci present in pus. Symptoms remained unchanged. Then, after a chill, temperature rose to 104°. Patient became delirious on fourth day. Both mastoids were opened, and found extensively disintegrated. The dura and sigmoid sinuses were exposed. The subsequent course was marked first by continuation of the cerebral symptoms. Mastoid wound remained very dirty. Then general improvement set in, the canal swelling diminished, and there was complete recovery.

Dr. CLEMENS said he had seen the patient, and was struck with the very pale condition of the mucous membranes, suspicious of tuberculosis.

Dr. BERENS spoke of three cases of **simple mastoiditis** on which he operated, complicated with malaria. In the first case the plasmodium was found, in the others the temperature reacted to quinine. He called attention to the unpleasant and puzzling complication malaria furnished in these cases, especially regarding the temperature. The patients recovered.

Dr. CLEMENS inquired whether the quinine had any deleterious effect on the mastoid wound. None.

Dr. EMERSON asked whether any unpleasant sensations from the quinine were noted. None.

Dr. ADAMS recollected a case where he had opened both mastoids and the temperature rose to 104°. The patient recovered under quinine.

Dr. KENEFICK asked the locality of the patients.

It was replied that one lived in New Rochelle and the others in this city near tunnel excavations.

Dr. STEPHENS, as guest, related a successful operation in a case of **brain abscess.** The patient was seen Oct. 1st, with pain in right ear; upper part of drum bulged and was incised, evacuating slight amount of pus. Mastoid was tender and there was some fever. Ice-coil applied and canal irrigated. On the following day the bulging had recurred, the drum was again incised without result. Pain continued. The mastoid was opened and found absolutely normal except that it was unusually vascular. The pain continued after operation. Temperature 100.4°; patient drowsy. On Oct. 23d, projectile vomiting set in. Pulse 66; choked disc, right more marked than left; reflexes normal; patient still drowsy. On 24th, pulse 56. Radical operation was performed and the superior and posterior walls of the canal removed. The dura under the squamous portion was exposed and found thickened. Incision was followed by the escape of 3 to 5 oz. thick pus. The wound was simply packed. In the subsequent treatment there was no irrigation and no drainage tubes were employed. After a certain length of time the packing was found to have been forced outside the opening, which was regarded as a healing process and the gauze was not reinserted. Complete recovery.

Dr. EMERSON asked whether pain was a conspicuous feature. It had been constant and severe.

Dr. HARRIS inquired whether any localizing symptoms had been present.

It was replied that though the size of the abscess was such as would lead us to expect localized symptoms, none were present. The question of aphasia could not be determined.

Dr. BRANDEGEE inquired whether the opening over the squamous portion had been made continuous with the opening in the upper wall of the canal—in other words, whether the zygomatic arch had been removed. He considered this an important point and was inclined to favor a separate opening through the squama for the treatment of brain abscess for the purpose of insuring this new opening from contamination by the mastoid wound.

Dr. ADAMS wanted to know why the sudden filling of the abscess cavity was not suspicious of secondary abscess.

Dr. STEPHENS thought it was not the case, because there had been no secretion.

As regards the operation and its site, Dr. KIPP thought the method should depend on whether there existed disease of the tegmen tympani or not.

Dr. LEWIS thought that the anatomy of the parts should be borne in mind, namely: the bony floor of the middle fossa is on a much lower level than any portion of the squamous plate of the temporal bone above the linea temporalis. For this reason an abscess situated low down in the temporo-sphenoidal lobe can not be drained as well, if an independent opening is made above this line, as when the floor of the middle fossa is removed.

Dr. BRANDEGEE related another case which he regarded as late infection. The patient had suffered from acute otitis of two weeks' standing, due to staphylococcus infection. He apparently got well and then returned with a subperiosteal abscess. At operation a perforation was found at the masto-occipital suture, the mastoid process was completely destroyed, sinus exposed, and a large epidural abscess exposed.

Dr. LEWIS said he had had two similar cases, where, after an acute purulent otitis media, the drum membrane had healed and the inflammation in the tympanic cavity had entirely subsided. Nevertheless, in one case two weeks later, and in the other case three weeks later, subperiosteal abscesses developed. In both cases at the operation epidural abscesses were found. In one case a number of perforations were found in and about the masto-occipital suture, and the whole inner plate of the mastoid process was necrotic, which upon removal revealed a very extensive epidural abscess, with granulations covering the underlying sinus and dura. Both cases made uneventful recoveries.

Dr. KIPP objected to the term "late infection" and thought that this was only a case where the symptoms had been latent for a time.

Dr. LEWIS related the history of a case of **brain abscess** in a young girl four years of age. The child was admitted to the New

York Eye and Ear Infirmary on March 29th last. The history of a long-continued foul-smelling discharge from the right ear, with the development, some ten days previous, of a swelling behind and above the ear, was obtained. The child was prepared for immediate operation.

The mastoid incision was extended upwards to and above the parietal eminence; this was made necessary because of the existence of a large subperiosteal abscess, filled with a most foul-smelling pus and occupying a space extending upwards (from the mastoid tip) over three inches and from one to one and a half inches in width; the periosteal walls were gangrenous. The bone over a small area immediately below the parietal eminence was of a purple-red color (evidently a beginning necrosis). The mastoid cells were opened and much cholesteatomatous material evacuated; the posterior canal wall was removed and the tympanic cavity curetted of all granulations; the usual flap was made from the membranous external auditory canal. The dura was exposed above the tympanic roof and found to be normal. Because of the necrotic condition of the periosteum the wound was left open throughout its entire extent.

Notwithstanding the fact that the child was a puny specimen of humanity and did not possess much recuperative power, the wound made fair progress towards healing. Suddenly, while sitting up in bed on the morning of April 22d, the child collapsed. When Dr. Lewis reached the patient, a few hours later, she was unconscious, with a pulse of 120 and a temperature of 106° F. No paralyses nor anæsthesia were present. The patient was prepared for another operation. The opening made at the first operation in the tympanic roof was enlarged until it extended upwards and backwards towards the parietal eminence a distance of about three inches and was about one inch in width. The dura mater immediately above the tympanic roof, which had been exposed at the first operation, was covered with healthy granulations and the dura mater on further exposure was found to be healthy from a half to three-quarters of an inch beyond; as the area of bone, which at the first operation was seen to be of a purple-red color, was approached, it was found to be softer and more friable, and immediately under the centre of this area was found a perforation in the dura mater; the granulations covering the latter were most exuberant at this point. Through this perforation pus exuded and a grooved director passed two inches into the brain before it met with resistance. The dura mater was incised, with the liberation of some non-odorless pus and a small amount of blood clot. On introducing a cephaloscope into the abscess cavity, its bottom was found to be filled with a blood clot; it was concluded that this clot was the result of a recent hemorrhage and the cause of the collapse a few hours previous and so was not disturbed.

Following the operation, the case was dressed daily until the fifth day, when, but little pus being present, the blood clot, with the aid of the cephaloscope, was removed. Dr. Lewis was surprised as the last piece of blood clot was removed to find the lumen of the cephaloscope fill up with a clear fluid; by means of cotton-tipped applicators rapidly used he was able to stop the flow sufficiently long to obtain a view of the bottom of the cavity, which was smooth and of a pinkish white color; the fluid rose and fell with each inspiration and expiration; the descending horn of the lateral ventricle undoubtedly formed the floor of the cavity.

A week later, as only cerebral fluid was exuding from the cavity, the gauze drain was removed and on the next day the cavity had closed. The child is now up and is gaining in weight and strength daily. A small hernia cerebri is still present. The abscess was in all probability situated in the posterior portion of the first temporo-sphenoidal convolution.

Dr. HEPBURN said that he had the opportunity of examining this deep opening in the brain with the cephaloscope and was also struck with the curious condition of the wall of the lateral ventricle.

Dr. A. KNAPP related a case of a **foreign body** in the **canal** and middle ear which he had been called upon to treat. The child had come to him after attempts at extraction had been made elsewhere. The foreign body appeared as a black mass situated very deep in the canal. The external auditory canal just external to the foreign body was swollen and granulating. Under ether and with the aid of a long hooked instrument it was possible to break up the foreign body which proved to be a bean, and extract it in fragments. After removal the drum membrane was found completely absent. The promontory wall lay bare and denuded of membrane and the surface anterior to it contained granulations. From the outer wall of the attic a thin process of bone hung down, but it was impossible to say whether this was the long process of the malleus or incus. The subsequent course of the case was uneventful, except that vomiting existed for a day and later a slight otorrhœa developed. Dr. KNAPP wished to know the opinion of the Society as to what indications should immediately precede the detachment of the auricle for removal of foreign bodies.

Dr. KIPP thought the most important element was patience on the part of the operator; that he always succeeded in removing foreign bodies through the canal.

Dr. ADAMS thought the auricle should be detached only as a last resort.

Dr. HEPBURN related a case in which he had been forced to make an incision behind the auricle to extract the foreign body.

Dr. HARRIS also told of a case where it had been necessary to detach the auricle to remove a foreign body; the case terminated fatally on the third day.

Dr. BRANDEGEE spoke of a glass bead which was situated in the canal and which it was impossible to remove without detaching the auricle.

Dr. EMERSON thought the instillation of oil of great service in the removal of foreign bodies in the canal.

As illustrating Dr. Kipp's remarks upon the utility of waiting in these cases, Dr. DUANE cited the case of a small boy who came to him with a mass of putty in his ear, which had been inserted a month before and which was as hard as stone. It was lodged firmly in the bottom of the canal, and covered the entire drum membrane. Attempts at removal even under ether were entirely futile. After antiphlogistic treatment kept up for a couple of days, the swelling of the parts subsided, and the mass was readily removed by the syringe.

REPORT ON THE TRANSACTIONS OF THE SECTION ON OTOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. JOSEPH KENEFICK.

STATED MEETING HELD THURSDAY, MAY 8, 1902.

JAMES F. McKERNON, M.D., in the Chair.

Mastoiditis with thrombosis of the lateral sinus — ligation of the internal jugular vein — recovery.

Dr. EDWARD B. DENCH: The patient whom I have the pleasure of presenting before this Section was first seen by me on November 11, 1901. She had been suffering for a number of weeks from acute suppurative otitis media, involving both ears, the right ear being more extensively involved than the left. When I first saw the patient, both ears were discharging; the right mastoid process was excessively tender, the left but slightly tender. It was decided that immediate operation was necessary upon the right mastoid process. The patient was placed upon the table, and the typical mastoid operation was performed. The entire cortex was removed, and the mastoid cells were found to be extensively broken down in every direction. During the operation, the dura of the middle cranial fossa was exposed over an area of about a half an inch in diameter, and the lateral sinus was exposed for a length of three-quarters of an inch above the knee. Upon both palpation and inspection, the sinus seemed to be perfectly normal; it was, therefore, not opened. As the patient had only been under my observation for about three-quarters of an hour prior to the operation, it seemed unwise to open the sinus for exploratory purposes, the vessel having the appearance of being perfectly normal, as before stated. All carious areas were removed from the mastoid, the tip was taken away, and free communication was established between the mastoid antrum and the middle ear. The ordinary antiseptic dressings were applied, and the patient was returned to bed. A free incision was made through the left membrana tympani, at the time of operation, in order to secure free drainage, and to abort what seemed to be a beginning mastoiditis. The subsequent history of the case was uneventful. Under regular irrigation, the discharge gradually became less and less from the left ear, and finally disappeared altogether, all mastoid tenderness having completely vanished at the end of forty-eight hours after incision of the drum membrane. The operation wound upon the right mastoid progressed favorably, and the patient was discharged from the hospital about four weeks from the time of operation. After that time she came regularly to the out-patient department of the hospital, to have the wound dressed, and seemed to be doing well until the middle of January, at which time she began to complain of severe pain in the head. At this period, she thought she had some fever. On examination the wound seemed rather foul and some granulation tissue was curetted away. There was considerable tumefaction of the tissues of the neck below the lower extremity of the mastoid incision. Careful probing failed to reveal any pus. The dressing was reapplied and the patient was sent home with instructions to report the next day. Two days later I saw the patient, and as she seemed to be quite ill, I advised her to come into the hospital; this she did on the following day, January 17th. At the time of her admission the temperature was normal; three hours later the temperature rose suddenly to 105°, and the patient had a pronounced chill. I was at once notified, but as I wished to observe the temperature curve, I advised no medication. The temperature dropped suddenly to normal on the morning of the following day, but in the afternoon at six o'clock it registered 105°, and one hour later it was 106° in the mouth and 107° in the rectum. In the meantime, the blood had been examined for plasmodium malariæ, but no organisms had been found. An examination of the blood also failed to reveal the presence of leucocytosis. In spite of the fact that there was no increase in the number of white blood cells, I decided that the temperature could only be due to infection of the sinus, and, therefore, decided to do an exploratory operation, having for its object the exposure of the sinus in the original wound. For this purpose the patient was placed upon the table, and under ether anæsthesia the original wound was opened and the sinus exposed. It was found to be filled with a soft clot. The curette was introduced downward toward the jugular bulb, and removed considerable broken-down blood clot. Free hemorrhage did not follow the use of the curette. I therefore decided that there was a clot in the vein below the bulb, and immediately proceeded to excise the internal jugular. The vein in the neck was exposed throughout its entire length, from a point just above the clavicle to its entrance into the base of the skull. Two ligatures were passed about the vein just above the clavicle and the vessel divided between them. The entire vein was then rapidly dissected out. Low down in the neck the vessel contained fluid blood. The tributary thyroid and laryngeal branches were considerably enlarged, and it was necessary to ligate them before dividing them. The vein seemed to be normal in structure until just above the point where the lingual and facial veins were given off. Above this point the vessel was so much thickened, that it resembled more the internal carotid than the internal jugular. It was only possible to distinguish between the two vessels by knowing the relative position of each. After the common lingual and facial trunk had been divided between two ligatures, two ligatures were passed about the internal jugular at the base of the skull, and the vessel divided between them. The walls of the vein close to the base of the skull were almost a sixteenth of an inch in thickness. The lumen of the vein was much narrowed and contained a soft clot. The muscular structures within the wound were then united by interrupted catgut sutures, the superficial wound was closed by interrupted silk sutures, and the wound healed almost entirely throughout by first intention. There was slight breaking down of the wound just at the point where the lingual and thyroid veins were given off, and at another point just above the clavicle, corresponding to the region where the proximal end of the vein was ligated. Localized infection of the tissues undoubtedly took place at these points through the infected blood which escaped when the vessels were divided. The temperature fell immediately after operation, and remained normal for four or five days. At the end of this time it rose abruptly to 104°, and for several days the evening temperature was high. This was undoubtedly due to small collections of pus in the regions already mentioned. As soon as the pus was evacuated from these localities, the temperature became normal, and the patient made a good recovery.

This case is instructive because it illustrates the necessity of eternal vigilance in the management of cases of this kind. From the fact that the patient did perfectly well for about eight weeks after the first operation upon the mastoid, I am convinced that secondary infection of the wound occurred owing to careless dressings, and that this wound infection was transmitted to the sinus, causing thrombosis of that vessel. At the time of primary operation the sinus, as I have said, was normal, and in the primary and in all subsequent dressings performed while the patient was in the hospital the sinus wound was carefully isolated, by gauze packing, from the focus of infection within the mastoid and middle ear. At the time of the secondary infection, about the middle of January, two months after the primary operation, all discharge from the middle ear had ceased. It is, therefore, impossible to assume that secondary infection of the sinus took place from the middle ear. The only other possible avenue of infection must have been through the granulating mastoid wound.

I, therefore, want to insist that it is necessary for the utmost care to be exercised in the dressing of all mastoid cases, especially those in which the lateral sinus is exposed during the operation. It must be remembered that the slightest lack of proper aseptic precautions may cause infection of the sinus in these cases, even at a very late period. No patient is absolutely safe until the wound has completely closed.

A recent Stacke operation illustrating the result of wound closure by buried sutures.

DR. WENDELL C. PHILLIPS: This patient came to the clinic at the Post-Graduate Hospital about one year ago. All methods known were used to bring about a cure of her chronic suppurative otitis media, which dated from early childhood, the result of an attack of scarlet fever. There has been a continuous suppuration from that time, and she is now nineteen years of age. There was necrosis of the annular ring and a general necrosis of the attic. I finally told her she would never recover unless she submitted to a radical operation. She readily gave her consent. There was no sign of mastoid disease. On the eleventh of April a classical Stacke operation was performed, *i. e.*, separating the ear and forcing the whole ear forward and commencing the operation at the annular ring. I used the Stacke director. I did not open the mastoid cells. After curetting thoroughly I divided the skin of the posterior wall of the canal and pushed one section well up into the attic and anterior cavity. I then closed the periosteum over the wound with catgut sutures. Afterwards I brought the other surfaces together with chromicized catgut, the ten-day chromicized catgut as prepared by Van Horn & Company, of this city, applying the sutures subcutaneously without coming through the skin at all, and in this way I avoided any chance of suture abscesses or scars. Six days afterwards the whole wound had closed and united, and to-night the scar is very slight. The result in the ear has been that, to my surprise, dermatization had commenced in the region of the attic and has quite advanced. So much of the posterior wall was forced outwards that there now is a small section of bare bone on the posterior canal wall. The patient now states that "there is almost no discharge." I brought her here especially to show the beautiful-looking scar resulting from the use of buried sutures.

Two cases illustrating the effect of wound closure by buried sutures.

Dr. TALBOT R. CHAMBERS, of Jersey City: When I heard that Dr. Phillips intended to present a patient showing the result of wound closure by buried sutures I thought I would present these two patients. In one, a mastoid operation was done three weeks ago. This child, ten years old, at birth was injured with forceps and has had a running ear which I had tried for eight years to cure without avail, and the mother said she wished an operation, which I performed, and found cholesteatoma in the attic in contact with the facial nerve. In this other case a mastoid operation was done. I brought the patients to show the results of the buried sutures. In both cases the wound appears as an unwrinkled straight line and is to be greatly preferred to the interrupted sutures; besides, on its removal a gentle pull removes the whole suture after it has accomplished its object, of coapting the wound surfaces.

Dr. T. PASSMORE BERENS: I do not know yet whether the Doctor brought the patient to illustrate the unusually quick healing from the Stacke-Schwartze operation, or the buried suture that has been so long in use.

Dr. W. P. BRANDEGEE: I should like to ask the Doctor if, in acute cases, this method of closing the wound is always applied.

Dr. T. R. POOLEY: Whilst there is nothing new whatever in such a method of closing the wound, still I think that in acute mastoid operation it is bad surgery. The cases that are shown here are exceptional to the general rule, although I believe such a procedure is applicable to the Stacke operation.

Dr. PHILLIPS: I should like to ask regarding the acute cases, whether he packed with gauze or not, or did he close it up completely without packing. In my experience blood clots break down and, therefore I should prefer packing the wound in its lower part and closing it all but its lower portion, so allowing for drainage.

Dr. CHAMBERS: The wound was closed almost down to the bottom. The tip was taken away because there was a breaking-down mastoid, although it was an acute case. The wound was thoroughly cleansed after the operation, and there was no discharge. To-day the hearing is not very good.

In Jersey City, in cases where the pus is sanious, or staphylococci or streptococci or pyocyaneus are present, singly or combined, we generally expect to leave a little opening at the bottom of the wound at the region of the tip. If it is thought that we could make a large opening through the posterior wall of the auditory canal we then close up entirely the skin wound behind the ear. A large percentage of our mastoids are thus treated. And the resulting scar is scarcely perceptible six months later.

Dr. W. H. BATES: I have done a great many Stacke operations and sewed the wounds. I am very much interested in the cases presented by Drs. Phillips and Chambers, showing the use of buried sutures. If this is done for the purpose of preventing the formation of a scar, I do not see that we gain much by using catgut sutures; my cases heal within a week with not any more of a scar than is shown by these cases. After one month, or two at the most, there is no line of incision noticeable. I believe that my good results were obtained because I used a very fine silk suture such as was first introduced by Dr. G. T. Stevens for stitching the eye muscles, No. ooo black silk. When fine silk is used I have never observed in any of my cases the formation of a single stitch abscess.

Dr. JAMES F. MCKERNON: I should like to ask with regard to the Stacke operation, if there ever was given a history of a previous mastoid operation.

Dr. PHILLIPS: I could not get any history of a previous mastoid involvement, but I am inclined to believe that every chronic suppurative condition with extensive necrosis is the result of an original antrum or mastoid involvement and, if proper operation had been performed, would have been cured. But, in this case, there was given no history of such a condition, and I found no evidence of mastoid involvement being operative.

In answer to Dr. Bates, I must say that I agree with him, but the wounds in the skin do not disappear until after a long time. This form of stitching, for the time being, is much more pleasing. I should like to suggest to the members that if they intend using this plan there are but a few preparations of catgut that can be used, for they must be prepared very carefully. I use the chromicized catgut as prepared by Mr. Van Horn,—what he calls his ten-day catgut.

Dr. CHAMBERS: I seldom use catgut, preferring boiled silk. When I intend to remove it I withdraw it about one-quarter of an inch from the wound and cut it off; the other end is then withdrawn by pulling, and the patient seldom knows when it is out. A presbyopic can remove it in this way without glasses.

Extensive epidural abscess.

Dr. W. P. BRANDEGEE: Typical cases are not infrequent, and some of the interesting complications observed often deserve more than a passing comment; this explains my reasons for presenting this case. Among the most interesting features about this case of epidural abscess are: (1) the problematical source of the infection; (2) the immense destruction of tissue involved, and (3) the anterior zygomatic cells, tip cells or antrum were not involved in the acute inflammatory process.

The patient, sixty-one years old, came to Dr. Dench's clinic on the 3d of January last, giving the following history. For five weeks he had suffered pain in the left ear, and for the past two weeks it was constant and he could not sleep. He certainly looked sick. He had a temperature of about 100, with the pulse in the neighborhood of 80, and respirations normal. Physical examination revealed a bulging drumhead with slight tenderness evinced by deep pressure over the mastoid antrum; there was no tenderness at the tip whatever. The patient was admitted to the wards of the hospital, gas was administered, and a free incision made, with some relief to the patient, who slept well that night. In the morning he complained of a little pain. The ear was douched with a 1:4000 bichloride of mercury solution every two hours. The discharge showed that there was a mixed infection, pneumococci and staphylococci being present. The discharge continued for ten days, when it ceased entirely. In ten days following the operation the drum was normal in contour. There was no mastoid tenderness or temperature, and the patient felt well and so was permitted to walk around the ward. He was discharged fifteen days after his admittance.

One week later he came back complaining again of pain in the left ear and loss of sleep. At that time there were on the side of the head two large subperiosteal abscesses, one being about the size of a hen's egg. There was no history of trauma given. The drum membrane was clear and the superior wall was not at all prolapsed. There was a very slight mastoid tenderness. Operation was advised and accepted. I operated and, in making the typical incision (mastoid), no pus followed. Cutting down upon the cortex it was found to be good and sound. No pus was contained in the zygomatic or antrum cells. Apparently there was no dead bone or granulation tissue. The bony cavity was curetted. An incision was then made backward two and a half inches from the original mastoid incision through the abscesses and down to the pericranium, and then a great deal of the pus followed. After the bleeding was stopped and the periosteal flap was retracted, a perforation was found at the squamo-occipital suture, a little anterior to it. The pus simply poured out. With the rongeur forceps the opening was enlarged and a cavity exposed, the epidural floor of which was the size of a half-dollar. The dead bone was removed around the perforation; the posterior mastoid cells were removed, including the walls of lateral sinus. The sinus was covered with gauze, and I proceeded to clear out all dead bone and granulation tissue. The wound was very deep. After the mastoid cavity and sinus and the dural wound had been packed off separately with iodoform gauze, an external dressing was applied and the patient removed to the bed in the ward. He remained in the hospital until March 14th, made an uneventful recovery, and was discharged on that day. The wound healed by granulations.

Dr. **Edward B. Dench**: Remarks on Dr. Brandegee's case. An interesting point in the history of this case is the possible way in which infection took place. Some time ago I reported a case of an epidural abscess which occurred in a young patient after the use of the ice-coil. In this instance there was no involvement of the mastoid, but an epidural abscess was found quite far back and practically in the same region as in the case just reported.

The abscess was about the size of a quarter, and was situated so far back that I entirely overlooked it. The operation upon the mastoid had been practically completed, and, in stripping up the periosteum of the posterior flap, to be certain that I had left no softened bone in this region, I saw pus welling up from a minute opening in the bone, well under the margin of the posterior flap. I then split the posterior flap by a horizontal incision, extending backward toward the occiput, also exposing the opening from which the pus was oozing. This opening was enlarged and an epidural abscess, of the size mentioned, was found.

It seems to me that in these cases the inflammatory process extends along the wall of the lateral sinus. Such an inflammatory process may extend from the middle ear along the wall of the sinus without causing a thrombosis of the vein. In other words, we have a perisinusitis present. It is not necessary in these cases that the mastoid process shall be involved. Extension may take place along the sinus wall directly from the middle ear, without interfering with the blood current within the sinus.. After following the course of the external sinus wall backward for a certain distance, an extradural collection of pus forms. As in the case presented by Dr. Brandegee and in the case reported by myself, it is not necessary that there should be any gross infection of intervening mastoid cells. Why the pus should locate itself in this particular region is entirely beyond our ken.

Extensive caries of the mastoid without rupture of the tympanic membrane.

Dr. J. B. RAE: This patient presented himself at Dr. McKernon's clinic, April 16th, complaining of pain in and behind the ear. A very indefinite history was given. Four weeks previously, while in Philadelphia, he had an earache and pain behind the ear, which compelled him to seek relief, and, for the following three weeks, he received treatment in that city. During that time there was no discharge from the ear. At the end of three weeks he came to New York, still complaining of intermittent pain in the ear, at times permitting and at times preventing sleep. After a week's time he applied for treatment at the New York Eye and Ear Infirmary.

Upon examination there was found a prolapse of the posterosuperior canal wall and some tenderness on pressure over the antrum. No perforation or cicatrix of the drum was found. He was advised to submit to operation, which he did. Upon retracting the periosteum a drop of pus oozed from the bone in the region of the obliterated masto-squamosal suture. The bone was curetted and a small cavity was left which by no means was continuous with the antrum; there was sound bone between the antrum and the point of perforation, as far as could be detected by the eye. In removing the carious bone it was found that a liberal exposure of the sinus had to be made. From the sinus walls and the bone over the sinus pus constantly oozed. The usual mastoid wound had to be extended backward and a triangular flap turned down to allow of complete removal of softened bone.

While the case is by no means unique, I think that it presents certain points of interest. In the first place it seems to me an unusual thing to find a lack of acute subjective symptoms in cases which only can be called acute cases. In the second place there was such an extensive involvement of bone without any rupture of the membrana tympani. The point of perforation of the cortex is also a somewhat unusual one.

The moral of the case is that cases which fail to present acute subjective symptoms are apt to be overlooked and operative interference postponed beyond the limit of safety. Four weeks before operation this patient, at least it would so appear in view of the indefinite history, was in as much need of operation as at actual time of operation.

Dr. Wendell C. Phillips: I have recently had an experience so similar that it would seem not out of place to relate it. One week ago on Friday a physician brought his daughter to me for treatment; she was a girl fourteen years old, a very strong, healthy, vigorous child. She gave a history of grippe of about three weeks' standing, and for the past seven or eight days she had pain in her ear, which on one or two occasions was so severe as to keep her awake at night. On the night previous (Thursday) she had suffered a great deal of pain about the ear. She had received no treatment of any kind; had not even been examined. When I examined the drum, instead of finding a bright-red bulging drum, I found a milky-white bulging drum, such as is seen in thin drums when pus is present. She had marked tenderness over the entire mastoid. With gas anæsthesia, I opened the drum, which was followed by the discharge of pus which showed the presence of pneumococcus infection. The discharge was very free. The ice-coil was applied and left on until the next day, Saturday. On Saturday I found still greater tenderness over the mastoid and a free discharge of pus, and I decided to operate, which I did on Sunday morning. Apparently every cell in the mastoid was involved and broken down posteriorily and anteriorly and underneath the zygomatic process, and the lateral sinus was exposed for a considerable distance. In short this was a case of extensive mastoid infection with no rupture of the drum.

Dr. EDWARD B. DENCH : Several years ago I operated upon a case at the Polyclinic Hospital, in which there was absolutely nothing demonstrable in the middle ear except a suspicious redness, which might come from the prolonged use of the speculum. The drum was incised over the area of redness and no discharge followed, except some blood. The patient's pain continued. Two days later I operated and found the antrum full of pus, although the drum membrane was nearly normal and with only a suspicious redness above the process of the malleus. This was the only case I ever saw where there was practically a normal drum membrane and yet pus in the mastoid.

Dr. TALBOT R. CHAMBERS: Two weeks ago Friday, about eight o'clock at night, a child was brought in with suppurating glands under the chin. A history of running ear and pain over the tip and antrum of the mastoid was given. The child had a temperature of 105°, and was delirious. I think these are the symptoms that call for a mastoid operation, and, at ten o'clock, I did a mastoid operation, but found no pus nor disease of the mastoid. I then went farther into the tympanum and found nothing. I took a probe, placed on its end some sterile cotton and rubbed it around in the wound and then over the agar-agar jelly, but found no germs at all. I next placed on a sterile dressing. On Sunday morning, thirty-six hours later, the temperature was 105° and the patient's condition was not good. The delirium continued, the respirations were 44, and temperature 105°. There was pneumonic consolidation. The patient was turned over to the medical side. At the end of a week the conditions subsided. When the dressings were taken down, at the end of a week, it was reported to me that all was broken down and pure staphylococcus albus was found, and so the wound behind the ear was infected.

Here was a case in which the symptoms called for operation. The chest should have been examined. I took the report of the case from others, and feel that a diagnosis of mastoiditis is sometimes difficult to make, assuredly.

Dr. T. R. Pooley: I do not want the gentlemen present to think that we cannot have disease of the mastoid without involvement of the middle ear. Dr. Knapp described an instance similar to the one detailed by Dr. Dench, in which there was a severe mastoiditis and extensive caries. His communication, I believe, was one of the earliest of that kind, very rare to be sure. In Dr. Rae's case it was evident enough that, although there was no rupture of the membrana tympani, there was nevertheless involvement of the middle ear.

Dr. G. B. McAuliffe: I had a case, occurring in a child, in which the temperature ran practically an afebrile course, never being above 99°. There was a history of a nocturnal earache eight days previous and there was present some swelling over the squama, over which the ice-coil was placed for twenty-four hours; there was no change in the tympanic membrane; the swelling did not go down, and so an operation was proposed, acceded to, and performed. The antrum was found to be carious and this caries led up to the squamous portion of the temporal, and here we found an epidural abscess the size of a dime. A peculiar point regarding this case was that the temperature ran practically an afebrile course. On the tenth day the patient seemed to lose interest in the surroundings and he took on a cerebral aspect which seemed to call for operation. The operation revealed the epidural abscess.

These cases exemplify the dictum of the French aurist who cited these cases of inflammation as " licking the drum and biting the mastoid."

Dr. James F. McKernon: I reported a case of primary mastoid disease before the New York Otological Society, and at the same time Dr. Sheppard, of Brooklyn, reported another. In the one I reported there was absolutely no evidence of any middle-ear lesion. The drum was of a pearly whiteness and there was no pathological condition present so far as I could detect, and yet there was an epidural abscess present (perisinuous). I do not think these cases are, by any means, infrequent. The case that Dr. Rae reports is one that I saw at the time of operation, and I was struck by the remarkable lack of symptoms presented, there being but two which would suggest an operative procedure, viz: prolapse of the posterior-superior wall partially hiding Shrapnell's membrane, and the moderate amount of tenderness over the mastoid antrum. Deep and continuous pressure was used and but very little pain was produced.

A case of tuberculosis of the middle ear.

Dr. W. H. Haskin : S. H. G., age thirty-two years, salesman, gives good family history. Has never had any illness until Febr. 11, 1902, at which time he first noticed a rapidly increasing deafness. Suppuration of the right ear followed shortly afterward, without any previous symptoms of pain, etc. There has been no loss of weight ; but for the past year the patient noticed occasional night sweats of moderate severity, and the development of a morning cough with a slight grayish expectoration. He suffers with some catarrh of the upper respiratory tract, and has a double deflection of the septum, but not sufficiently extensive to cause nasal obstruction.

Right ear : Marked deafness ; constant tinnitus ; constant pain past two weeks. Offensive discharge. External auditory canal is so constricted by an extensive perichondritis no view of the drum can be secured. The infiltration extends at least three-quarters of an inch from the drum. Eustachian tube open, and on inflation gives a perforation whistle.

Left ear : Marked deafness ; slight tinnitus. No pain, otorrhœa, or perichondritis. The drum is a peculiar creamy color bulging in both anterior and posterior lower quadrants, as if stretched over some foreign substance beneath. Hyperæmia over Shrapnell's membrane and manubrium. Canal uninvolved. The probe, when applied to the bulgings, showed them to be yielding, and gave the impression of a semi-solid mass beneath ; it produced no pain. Eustachian tube freely open, and gave no indication of fluid in the tympanum on inflation.

Hearing tests : Right ear — Voice, loud shouting slightly ; watch, $\frac{0}{40}$; Galton, o.

Left ear—Voice, loud shouting only ; watch, $\frac{0}{40}$; Galton, o.

Weber to left : Rinné negative.

Examination of the patient's chest showed marked consolidation of the right apex and the lower left lobe posteriorly, although no râles were found on auscultation. Dr. Smith submitted him to the X-ray, and verified the physical examination, and in addition discovered several areas of dulness throughout both lungs.

At the March meeting of this Section the case was presented for an opinion, and quite a number were given.

Using cocaine in aniline oil and alcohol as an anæsthetic, I made an extensive semicircular incision through the posterior and lower border of the left membrane, and found the middle ear and attic full of a cheesy pultaceous mass consisting of broken-down epithelial structure, but not revealing any tubercle bacilli under the microscope.

The membrana tympani was very thick, I judged almost a sixteenth of an inch, and bled very slightly. The lining membrane of the middle ear was also very thick and pale. I could not detect any caries after careful probing.

I washed out the cavity as thoroughly as possible, and ordered hot irrigations, which were kept up until April 1, 1902. On the 20th of March he came to me with intense pain in left ear and posteriorly over mastoid. On examination, I found the left canal almost closed by an acute perichondritis, with sagging most marked along superior wall. A free incision was made along line of greatest swelling, and the canal was packed with iodoform gauze.

After five days, all swelling subsided and pain disappeared.

Since April 1st have done nothing save cleanse both ears with dry cotton every other day.

He is taking cod-liver oil and creosote in increasing doses, and feels greatly benefited in general health, although his hearing has not improved.

I have been unable to find any tubercle bacilli after repeated examinations (in either sputum or aural secretions).

The perichondritis of the right canal has largely subsided, so much so that the membrane is now visible, showing two perforations surrounded with pale granulations. The tympanic membrane is much thickened, but no caries can be detected.

The secretion is very slight. May 1, 1902: The left ear has improved somewhat, and the outlines of the membrane are clearly defined again, having been obliterated by an inflammatory reaction for some time following the paracentesis.

The paracentesis wound is still patulous and surrounded by a thickened edge. The hearing has not improved, nor has the thickening of the mucous membrane of the tympanic cavity.

The right ear does not show any marked improvement in hearing.

He has had subacute attacks of perichondritis with considerable pain, but these have subsided under hot douching, having always a sagging superior wall and thickened perforated membrane.

To me it has been a most unique and interesting condition, and had I to care for another one I should not advise any operative treatment or any active method of treatment.

Both ears have been better when left alone, and, remembering the pulmonary conditions found in the patient, I have laid aside all thought of any radical operation for his relief.

Dr. McAuliffe: I should like to ask why he calls this a tubercular otitis.

Dr. Haskin: From the general condition of the patient and the condition of the right ear, which is absolutely typical.

Dr. Brandegee: What was the character of the discharge?

Dr. Haskin: Mainly of epithelial structures. The mass filled whole middle ear and extended to the attic, and was curetted out with the blunt ring curette.

Dr. Brandegee: Was there any recurrence after removal?

Dr. Haskin: None.

Dr. Phillips: I should like to ask if the ears appeared to be the typical tubercular ears.

Dr. Haskin: When the patient was first seen the right canal was completely blocked by an extensive perichondritis, but there was no pain. Two perforations were present. I have never seen such conditions due to anything other than the tubercle bacilli.

Dr. Phillips: I asked the question because the drums that I supposed were tubercular showed great destruction of tissue; in the case presented this was not so.

Dr. B. S. Booth, of Troy: How long in existence?

Dr. Haskins: Since the fourth of February.

Dr. P. Passmore Berens: It seems to me to be scarcely fair to call this a case of tuberculosis of the middle ear unless the tubercle bacilli are found. There may be a direct infection by way of the Eustachian tube, or by way of the lymphatics, but, in either case, tubercle bacilli should be found.

Dr. Dench: Was there any vertigo, or vomiting present, or any specific history?

Dr. Haskins: None.

Dr. E. L. Meierhof: In reference to the form of tuberculosis which may occur in connection with pulmonary tuberculosis, the mere absence of the tubercle bacilli does not always disprove any tuberculosis. Cases are seen in which the ulcerations are plainly in view and the diagnosis is made by the microscope and by exclusion ; sometimes after repeated scrapings the diagnosis is negative and yet the patient may have pulmonary tuberculosis. If we depend upon the microscope in making our diagnoses we must throw out a large number of cases that have been supposed to be tuberculous. In attic tuberculosis it comes on insidiously, and the drumhead is pearly and soft, and these cases are unaccompanied by pain.

Dr. DENCH : I think one of the commonest symptoms of tuberculosis of the middle ear is the painless perforations ; also, the multiple perforations which occur. The mere fact that we do not find the tubercle bacilli in the discharge does not disprove tuberculosis.

Dr. McKERNON : I should like to speak of a case which brings out some of the points already mentioned. Some two years ago I was asked by a colleague in this city, who had developed a discharge from the left ear, to examine him. I saw him in November and, at the time, he had a cough. Examination of the ear revealed a serous discharge with multiple perforations in the drum membrane, one high up above the short process, and there was a great deal of destruction of the drumhead. There was absence of pain even when the probe was passed in. I asked him if he had had his chest examined and he answered that he had not. He had always been apparently well. I took a smear and found nothing. I asked him to go to some diagnostician and have his chest examined, which he refused to do. From this time, February to March, I saw him eight or ten times and four smears were taken, two by myself, and no evidence of tubercle bacilli was found. He poohpoohed the idea of tuberculosis. He was taking cod-liver oil. The ear kept on discharging as though a low grade of inflammation were present. There was no more destruction at the end of six weeks. The diagnosis at that time was secondary tuberculous lesion of the middle ear probably due to a pulmonary lesion. He went to Saratoga in June and there developed an acute attack of laryngitis which was diagnosed as tubercular laryngitis. He was then taken to Dr. Janeway who said that there was a consolidation over the apex and at the base posteriorly of the right lobe. This man died of pulmonary tuberculosis in November of the same year. Six weeks prior to his death there was no appreciative change in the discharge from the ear, neither had there been any marked increase in the pathological condition of the middle ear.

A case of specific labyrinthine deafness.

Dr. Thomas R. Pooley presented a case of deafness from labyrinthine disease, due to hereditary syphilis. The patient was a young man of nineteen years who came to the clinic February 23, 1900, suffering from parenchymatous keratitis of both eyes. He was treated with a one per cent. solution of atropine and potassium iodide, but with little improvement, when injections of bichloride of mercury, 1:10,000, were made under the conjunctiva. The right eye improved, but the left eye became worse. This treatment was then discontinued, and the patient was admitted to the hospital. Inunctions of mercury were made and a one per cent. solution of atropine instilled twice daily, leeches applied, and 20 grains of iodide of potassium administered three times a day. Under this plan of treatment his eyes improved and he was discharged April 20th with no further inflammatory symptoms, and only the usual macula corneæ. January 22, 1902, he again came to the clinic, on account of sudden and complete loss of hearing which came on with loud and persistent tinnitus, vertigo, and staggering gait. There was not the slightest perception of sound, and bone-conduction was perfectly negative. An examination of the ears showed the usual appearance of chronic aural catarrh, but not enough to account for the absolute loss of hearing. A diagnosis of labyrinthine disease was made. He was admitted to the hospital, given mercurial inunctions and iodide of potassium in gradually increasing doses, but without any good result, and he was again discharged.

March 24th he was again taken into the hospital, the same symptoms being present, extreme vertigo, staggering gait, etc. On closing the eyes there was entire loss of equilibrum, but this was not so marked with the eyes open. Still he had roaring noises in the head and was absolutely deaf to all tests. All other medication was stopped and one-quarter (¼) of a grain of pilocarpine was given hypodermically for two weeks. The hearing in the left ear rose until at the end of two weeks he could hear a watch on contact and a moderately loud voice close to the ear. This improvement, however, was but temporary and the dose of pilocarpine was increased to one-half (½) a grain a day, but this was followed by so much disturbance to the stomach and heart that it had to be discontinued.

When shown to the Section, he could still hear voice in the left ear. The right ear remains entirely deaf. The case was interesting because of the etiology and, again, on account of the improvement in hearing from the use of pilocarpine after the entire failure to effect any improvement by anti-syphilitic treatment. It was also interesting to note that there was always a temporary increase in the acuteness of hearing after each injection of pilocarpine.

Remarks on Dr. Pooley's case:

Dr. **Edward B. Dench**: I think this is an extremely interesting case. I have under observation at the hospital the case of a young girl suffering from hereditary specific disease. On examination, the patient shows all the typical reactions of labyrinthine deafness. In addition to the above, the signs of hereditary syphilis, such as Hutchinson's teeth, etc., are present. This patient improved greatly under large doses of iodide of potassium together with pilocarpine hydrochlorate, adminstered internally to the physiological limit. In this patient the hearing became perfectly normal under this plan of treatment. She, however, passed from observation and was practically without medication for about a year and a half. When I saw her a few days ago there was considerable impairment in the hearing. I feel certain that the case will again improve upon large doses of iodide of potassium in conjunction with pilocarpine.

Another case of acquired syphilis has come under my observation recently. This occurred in a coachman whose hearing suddenly became so much impaired that he was obliged to give up his work. At the first examination, he denied absolutely any specific infection, and there was no evidence of hereditary syphilis. I, however, sent him to a prominent syphilographer, who told me that without question the man was infected. The patient was placed upon subcutaneous injections of one of the salts of mercury, and at the same time pilocarpine hydrochlorate was given in full doses by the mouth. The patient's hearing immediately improved and at the present time is normal, and he has been able to resume his work.

In the third patient, a baseball player, there was slight impairment of hearing, distressing tinnitus, and moderate vertigo, especially when exercising. The vertigo increased to such an extent that the patient was not sure of himself when practising in the field, and felt he would be obliged to give up his position. There was a history of syphilis six months before. Upon functional examination distinct evidences of labyrinthine involvement were found. In addition to this, there was some slight catarrhal inflammation involving both middle ears, both Eustachian tubes being slightly narrowed. Under subcutaneous injections of mercury and the administration of pilocarpine to the physiological limit, the vertigo entirely disappeared, the subjective noises were greatly improved, and the hearing became nearly normal. It was impossible for the patient to keep up the administration of pilocarpine as long as I desired. He had obtained so much relief from a comparatively short course of treatment that he felt justified in going on with his athletic work, which necessitated the abandonment of treatment for the present.

In regard to the administration of pilocarpine in these cases, I do not think that it is necessary to give the drug hypodermatically. The cases mentioned are simply examples of a large number in which I have obtained most flattering results from the use of this drug. In all of my cases the drug has been given by the mouth. If the drug is to be given hypodermatically, it is necessary for the patient to give up his work for the period during which the drug is being administered. As no beneficial results can be looked for until the drug has been taken for several weeks, the subcutaneous method is almost always inapplicable to a large number of dispensary cases. As before stated, I have administered the drug almost entirely by the mouth. The patient is given a 4 % solution of pilocarpine muriate, and is told to take four drops of this solution morning and night. This corresponds to about one-sixth of a grain of the salt. If the morning dose is taken very early, the patient can spend two hours in bed before going to his work, by which time the danger of taking cold during the stage of perspiration induced by the pilocarpine is passed. After the dose taken at night, the patient, being in bed, is naturally protected from any danger of taking cold during the stage of diaphoresis. In this way, the drug can be given without interfering with the patient's work. Another point which I think it is wise to bear in mind is, that it is not necessary to induce profuse diaphoresis in order to obtain the beneficial effects of the drug. The patient should take just enough to cause slight salivation, or a slight increase in the cutaneous secretion. Herein lies the advantage of giving the drug in solution. After the patient has acquired a certain tolerance for the drug he can gradually increase the dose, so that after each ingestion of the medicine a distinct but not excessive physiological effect is obtained. In this way, the best results are secured without weakening the patient and without causing him any undue discomfort.

Dr. PHILLIPS: I should like to ask if the vertigo was lessened by the use of the pilocarpine.

Dr. DENCH: Yes.

Dr. MEIERHOF: This sort of treatment in connection with syphilis is nothing new; we all know it is carried out at Hot Springs, and elsewhere. I know of one man who has had a large experience in the treatment of syphilis who, after he has exhausted all the good effects to be obtained from the iodides and mercury, orders the hot treatment, causing sweating either by hot baths or hot springs.

Dr. POOLEY: I was much interested in the remarks of Dr. Dench because his experience coincides with mine. Judging from a limited experience, I should say that the prognosis in labyrinthine deafness is better in acquired than in hereditary syphilis.

BOOK NOTICES.

VIII. **Lehrbuch der Ohrenheilkunde** (Text-book of Otology). By Prof. L. JACOBSON, M.D., and Dr. L. BLAU, Aural Surgeons in Berlin.

Third edition of Jacobson's *Lehrbuch*, 555 large 8° pages, with 345 illustrations on 19 plates. Leipzig: Geo. Thieme, 1902.

Jacobson's excellent text-book maintains its reputation in following thoroughly the rapid developments of otology since the appearance of the first edition, which presented a faithful portrait of the otology of 1894. The portrait taken by the second edition in 1897 was enlarged and more elaborate than the preceding, from which it distinguished itself by raising its character from furnishing not only all the knowledge that the educated aural practitioner needs, but also a most careful and comprehensive bibliography, affording the reader an opportunity to resort to the sources of otological knowledge, enabling him to become an investigator in, and a promoter of, aural science and art. The present edition follows the second in character, but so much had to be added to the subject-matter in the text, the illustrations, and literary references, in order to do justice to the advances made in our specialty during the last five years, that the author (Jacobson) found it impossible to do the work alone. He therefore associated with himself as coeditor of the new edition Dr. L. Blau, who for years had been his professional companion, and essentially shares his scientific views. He was fortunate in this choice, for Dr. Blau has long been credited with making the best annual reports on the progress of otology, and lately earned the thanks of the profession for his judicious and able editing of the *Encyclopaedie der Ohrenheilkunde.*

The improvements made in the third edition are comprehensively stated in the preface, and the reviewer thinks it best to transcribe them:

"Owing to the rapid strides in our science, supplements have been necessary in almost every chapter. The greatest number of additions or changes are in the sections on the faculty of hearing in the normal condition, the tests of audition, the differential diagnosis of the affections of the conductive and perceptive apparatus [pp. 54–89], on the pneumo-massage of the middle ear [p. 113, etc.], the chronic suppurative inflammation of the middle ear [pp. 206–230], the dry catarrh of the middle ear [pp. 241–257], the operative opening of the mastoid portion, including the "radical operation" [pp. 277–304], on deaf-mutism [pp. 404–411], on the otitic diseases of the brain, the meninges and sinuses, the otitic pyæmia and septicæmia, on the complications of the hearing organ in scarlet fever, diphtheria, tabes, and tuberculosis [pp. 474–478 and 486–490]."

"In the treatment of diseases we have given not only our views but also those of other authors, especially in departments that have only recently been conquered and where the best management is still sharply contended, as in the otitic complications of ear disease; further in diseases in which treatment thus far has proved unsatisfactory, viz., the dry middle-ear catarrh, where a large number of the therapeutic propositions may be welcome to many of our readers."

The arrangement of the book is of the category of those that are to supply the wants of two classes of readers: (1) students and general practitioners; (2) ear specialists. The wants of the former are distinguished by being printed in larger type. The anatomy —all in small type—is given in full detail, with four neatly executed lithographic plates, presenting all the details of the hearing organ, including the primary hearing and visual centres, the sensory auditory and visual areas being the places concerned in word-deafness and word-blindness.

All the chapters of the book are written with great care; the descriptions are unexceptionally clear; the diction is good, idiomatic German (free from provincialisms), so that the English-speaking student who wants to improve his German will have the double benefit of enriching not only his medical but also his literary knowledge.

The book can be conscientiously recommended to advanced students and aural surgeons. For beginners, the reviewer would advise a smaller book, *e. g.*, such as Hartmann's, Pritchard's, or Gorham Bacon's. H. K.

IX. **A Manual of Otology.** By GORHAM BACON, A.M., M.D., Professor of Otology in Cornell University Medical College, New York. With an introductory chapter by CLARENCE J. BLAKE, M.D., Professor of Otology in Harvard Medical School, Boston. New (third) edition. In one handsome 12mo volume of 437 pages, with 120 engravings and 7 plates in colors and monochrome. Cloth, $2.25 net. Lea Brothers & Co., publishers, Philadelphia and New York.

Dr. Bacon's popular treatise has just appeared in a new (third) edition. The text has been enlarged about twenty pages, new illustrations, and paragraphs on lumbar puncture and leucocytosis have been added. The book deserves its popularity.

A. K.

X. **Diseases of the Nose, Pharynx, and Ear.** By HENRY GRADLE, M.D., Professor of Ophthalmology and Otology in the Northwestern University Medical School, Chicago. Pages 547. Philadelphia and London: W. B. Saunders & Co. Price, $3.50 net.

This volume, the latest addition to the increasing number of text-books on diseases of the nose and ear, possesses some excellent features which will insure its popularity with general practitioners and students, and which will be greatly appreciated by those intending to practise the specialty of rhinology and otology. It is the result of a long clinical experience, and the author's aim has been to answer the many questions presenting themselves to the less experienced clinician, particularly in reference to those points not usually mentioned in the routine text-books. This object has been well attained, and the resulting treatise bears the stamp throughout of personal experience, of keen observation, and of sound judgment.

Book I., on diseases of the nose and pharynx, comprises about two-thirds of the entire volume, the remaining one-third forming Book II. on diseases of the ear.

Special care and attention have been given to topographical anatomy, which is dealt with in a particularly lucid style. The numerous illustrations are happily selected from the standard works of Zuckerkandl, Politzer, Gegenbauer, and Hajek. The discussions on etiology and pathology, on symptomatology and diagnosis, are concise and to the point and clearly based on personal experience. The chapters on general therapeutics and on local treatment and surgery are thoroughly practical and contain much detailed and valuable advice. The intimate relations between nasal and aural lesions are dwelt upon at every opportunity, and the removal of nasal obstructions is advised as "indispensable in affections of the ear which persist in spite of all other treatment."

The subject of adenoid vegetations is well presented. The indications for and the method of their removal are outlined in detail. As to general narcosis, the author is convinced that it does not in any way permit a "more thorough operation," and also that the pain in a well-arranged operation is "not sufficient to necessitate the superfluous risk of an anæsthetic." He uses a curved guillotine of his own device (practically like Schütz's adenotome) and praises the operation by means of this instrument as "the easiest, quickest, and most thorough." We don't doubt the effectiveness of the "curved guillotine," but we beg to state that a simple instrument like Beckmann's or a similar knife cannot be surpassed in effectiveness if properly handled, and that the cumbersome guillotine attachment may be dispensed with. The chapters on the nasal accessory cavities are extremely well written, and the whole presentation of this difficult subject is abreast of the most recent advances in the diagnosis and treatment of sinus diseases.

Book II., on diseases of the ear, is, as a whole, equally creditable to the author's thoroughness and good judgment. The clinical analysis is always lucid, and the therapeutic measures recommended are those that have stood the test of the author's personal experience. Much attention has been given to the "conservative treatment" of chronic suppuration. The presentation, however, of the modern surgical treatment of middle-ear disease is somewhat disappointing, and the description of the "radical operation" is perhaps a little meagre. But this is a small matter, as the technique of a difficult and delicate operation cannot be acquired from the study of text-books. Altogether, the author has produced an excellent and interesting treatise, which may be heartily commended to our readers. R. J.

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EDITORIAL NOTICE.

The **Archives of Otology** is a bi-monthly journal, published in annual volumes of about six hundred pages each, extensively illustrated with cuts in the text, half-tone text plates, and lithographic plates, many in colors. About three-quarters of the space is devoted to original papers, and the remaining quarter to a systematic report on the progress of otology, and to reports of societies, book reviews, and miscellaneous notes. The papers and reports are original, and only accepted with the understanding that they are to be published in this journal exclusively. The original papers in the English edition appear in the German (*Zeitschrift für Ohrenheilkunde*) either in full or in more or less abridged translations, and *vice versa.* Any subscriber who wishes to refer to the original text of a translated or abridged paper may, by applying to the editor, obtain a reprint which he is expected to return after perusal.

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The **Archives of Ophthalmology** is a companion journal of the ARCHIVES OF OTOLOGY with the following differences: The editors are Dr. H. Knapp of New York, and Dr. C. Schweigger of Berlin. The title of the German edition is *Archiv für Augenheilkunde*, edited by Dr. H. Knapp and Dr. C. Schweigger. The bi-monthly numbers are issued alternately with those of the ARCHIVES OF OTOLOGY, beginning with January. The annual volumes contain about six hundred pages. Price, $5.00 ; single number, $1.00.

VOL. XXXI. No. 5

ARCHIVES OF OTOLOGY.

PURULENT PHLEBITIS OF THE SIGMOID SINUS WITHOUT THROMBOSIS; DEATH FROM MENINGITIS; AUTOPSY.

By Dr. ARNOLD KNAPP.

A. M., aged thirty-four, has suffered from right-sided otorrhœa after scarlet fever in childhood. Five weeks ago the discharge ceased and severe pain was felt over the right supraorbital area. Twelve days ago chills set in, 1–3 a day, with profuse sweats, vomiting, and dizziness.

On admission, June 7, 1902, a heavily built man, seems very ill. Below right mastoid process œdema and tenderness extending anteriorly to angle of jaw and posteriorly in occipital triangle. Region of antrum normal. Depth of canal shows total defect. Granulations and thick pus at outer attic wall. $H = \frac{1/2}{60}$ T. 101.4° P. 104. Sensorium free. Eyes normal. Left ear normal.

Operation. July 7th. Totally sclerosed mastoid. Sinus displaced anteriorly. Small antrum containing purulent membrane, thick pus, and granulations especially at posterior and postero-external boundary. Sinus freely exposed throughout its vertical course; it is intensely dilated with very thin walls, compressible, surface smooth and shiny, and contains fluid blood. Antral walls smooth and eburnated; the bone just back of external semicircular canal sclerosed and discolored; no fistula. After removing the posterior wall of the antrum, together with the superior margin of the petrous bone, the dura internal to sinus was found covered with apparently healthy granulations; below and external to sinus normal dura was exposed. Owing to the anteriorly displaced and distended sinus, work in the depth was very difficult. The margin of the petrous bone removed to the labyrinth. Dura at site of granulations incised; free hemorrhage ensued. The lateral sinus at upper knee accidentally lacerated. Condition of patient had become very poor, requiring a saline infusion. Remnant of incus removed. Tympanum contained granulations.

June 8th–12th.—T. varied daily between 100° and 103°. P. 110. Frontal headache. Œdema and tenderness diminished along upper course of jugular vein. A chill on the 8th and the 12th. Delirious at night.

June 12th.—Dressing changed. Tympanum clean. Sinus soft and compressible. Area of bone external to semicircular canal white. No discharge. Eye-grounds normal.

June 13th.—Swelling in right suboccipital triangle had become circumscribed, indurated, and very tender. Some frontal headache. 9 P. M.—T. 105.8°; P. 136; R. 32. Has been very restless, but takes nourishment.

June 14th. Operation.—Incision is prolonged downward and also backward at right angles. The site of induration is exposed and the lower surface of the occipital bone investigated, but no abnormity discovered. The mastoid emissary vein was hereby opened and bled very freely. Posterior margin of mastoid removed, dura appeared healthy. Some more of the posterior petrous surface, including a part of the bony labyrinth, resected, but no change found in dura. Tegmen antri removed without avail. No change in tympanum. Jugular vein ligated; it contained fluid blood and was normal.

June 15th–18th.—The patient's condition grew worse. The temperature remained high, between 105° and 106°. Delirium and stupor. Subsultus, urine, and stools passed involuntarily. Another chill on June 17th. Eyes normal. Died June 18th, 3 A. M.

Autopsy, 2 P. M., 18th. — Beneath cortical pia in sulci pus; some pus about central ganglia, pia and arachnoid very much thickened, reddish spongy tissue. Slight free pus in cerebellar fossa. Not much in spinal canal. Brain normal. Pus in ventricles. (Microscopic examination showed groups of cocci, often in pairs and chains.) Dura on anterior and posterior surface of petrous bone normal. Superior petrosal and cavernous sinus normal.

The temporal bone is removed. The inner wall of the tympanum is covered by a dense granular connective-tissue membrane, obliterating the landmarks. No stapes. The sigmoid sinus bulges into the mastoid wound and is enormously dilated for a distance of 3 *cm.* The anterior wall is so thin as to be almost translucent and measures 3 *cm* on the flat, when pressed out. The posterior wall is thickened and measures 1 *cm*. On the medial side of the dilated sinus wall there is an area of the dura, 1 by ½ *cm*, covered with granulations at a point back and out from the external semicircular canal. Farther inward the dura is very adherent to the bone. The lumen of the sinus, owing to its dilated anterior wall, is so large that the opening of the superior petrosal sinus is unusually far in. Below and back of this, the posterior sinus wall, on being incised along its course, is seen to be thickened by a diffuse infiltration of all the coats of the vein which stretches across from side to side and extends down into the bulb. The infiltration seems to have broken through into the lumen and presents a rough necrotic surface. A vertical section of the infiltrated sinus wall is made and prepared for microscopic examination. This shows purulent infiltration of the entire venous wall. Externally a small part of the normal wall still remains. The central portion is occupied by granulation tissue and hemorrhages, while the part facing the lumen is composed of pus cells.

This case presents some very unusual and interesting features, both clinically and anatomically.

A patient with unquestioned pyæmia of aural origin, having two to three chills a day, at operation presented an enormously distended sinus with a thin but healthy anterior wall; the sinus contained fluid blood. The sigmoid sulcus was normal. The bone posterior and external to the horizontal semicircular canal seemed unhealthy, and the neighboring dura was covered with apparently healthy granulations. The pyæmic condition, though improved at first, continued; the swelling in the right suboccipital triangle became circumscribed. At the second operation the floor of the occipital bone was explored to no purpose, and as the bone near the labyrinth seemed unhealthy this was further resected. No new lesion found. The lateral sinus still contained fluid blood. The jugular vein was ligated. The patient's condition grew steadily worse; meningitis became more marked, and led to the patient's death.

At autopsy, meningitis was found and an unusual condition of the sigmoid sinus. The descending portion was enormously distended, the anterior wall was very thin but healthy. The posterior wall was thickened, measuring 6 *mm;* all of the coats of the venous wall were infiltrated, the central part was red, and the part projecting into the lumen was gray and rough, apparently necrotic. Microscopic examination of the sinus wall revealed the presence of granulation tissue, showing that the process was of some standing and tissue repair had been attempted. This infiltration extended down through the bulb to the beginning of the jugular vein, thus producing the deep suboccipital induration.[1] The cerebellar surface of the dura appeared perfectly healthy. The sinus contained a recent blood-clot. The infection presumably extended from the antral wall posterior to the horizontal semicircular canal to the dura, causing pachymeningitis, then involving the posterior wall of the sinus, the anterior remaining healthy. It is difficult to account for the extreme distension of the sinus wall, unless we assume a congenital anomaly, for an acquired distension would equally, if not more, have affected the less resisting, *i. e.*, the cerebellar wall. On the other hand, as the distension of the anterior sinus wall depended on a similar change in the sigmoid sulcus, a condition of sclerosis of the temporal bone may have been the primary change. Osteosclerosis is described as a deposition of new bone in the pneumatic air spaces; this, however, must be associated with a diminution in size as the mastoid processes operated on in chronic otorrhœas are always small-sized, and the antrum is usually diminutive unless associated with a cholesteatomatous process. It is remarkable that thrombosis and obliteration of the lumen did not take place. This may possibly have been on account of the enormously distended lumen, though a dilated sinus must be associated with a retarded blood current, a condition usually regarded favorable to thrombosis. As the sinus contained fluid blood, and the anterior wall was normal, there seemed to be no reason for widely opening the sinus; the morbid condition of the posterior wall was therefore not discovered.

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[1] Macewen, *Pyogenic Diseases of the Brain and Cord*, p. 26.

A CASE OF CHRONIC PURULENT OTITIS; EXTRADURAL ABSCESS; MENINGITIS; DEATH; AUTOPSY.

By Dr. ARNOLD KNAPP.

J. L., thirty-four years of age, had suffered from left-sided otorrhœa for twenty years, following scarlet fever. He now complained of pain about the ear and over the left eyebrow; vertigo, and very fetid discharge.

On admission there is a cicatrix over the left mastoid process; no tenderness. The drum is absent. There are granulations in the lower part of the tympanum, and the upper part of the drum is shut off by a membranous band, under which the probe enters the aditus. H = 0. Bone conduction (C) − 25 seconds.

Operation, May 30, 1902.—The middle-ear cavities were exposed according to the Zaufal-Küster method. The bone was eburnated. The antrum contained pus and granulations. The aditus was found enlarged. There were no ossicles. After completing the removal of the posterior canal wall, a reddish fibrous structure was found exposed, which could be followed into the aqueductus Fallopii, passing over the oval window; it was the inflamed facial nerve. There never was any facial convulsion. The oval window could not be identified. A modified Panse plastic was done.

The subsequent course was uneventful except for pain referred to the back of the left ear and extending down the neck. The pain diminished later, but the patient was often restless at night. There was facial paralysis. The temperature remained at 100° for three days and then became normal. The wound healed smoothly.

On the evening of June 11th, he suddenly became very ill. The pain in the head was very severe and the temperature shot up to 104°. Pulse 90. Wound clean. No tenderness about the ear. Eye-grounds normal.

June 12th.—After a very poor night patient refused food, complained of severe headache, appeared apathetic, and was aroused with difficulty. The temperature, which had gone down to 101.2° during the night, rose to 105.3° at three in the afternoon.

Operation.—After reopening the retro-auricular incision, the mastoid wound was found clean. The posterior wall of the petrous bone was then removed, starting externally. The bone was sclerosed. The sinus was prominent and seemed to be covered with fibrin, but was soft and contained fluid blood. Directly internal to the sinus a whitish exudate was found on the dura, and then internal to this point a small collection of pus was evacuated. On removing some more bone, the dura showed an opening through which the cerebro-spinal fluid escaped. No communication could be found between this cavity and the antrum, but there was a very small area of discolored bone on the inner and posterior wall of the antrum, without any evidence of a fistula.

June 13th.—Temperature 105°. Pulse 116. Respiration 22. Paralysis of left external rectus. Delirium. Nosebleed. Complained of extreme frontal headache. Some pain below mastoid.

June 14th and *15th.*—The temperature remained high. Patient comatose. Rapid respiration. Rigidity of the neck. Lumbar puncture drew off turbid fluid. The signs of meningitis became more pronounced, and the patient died on June 16th at 2 A.M.

Autopsy.—Diffuse meningitis, especially at the base. Sinuses free. The upper surface of the temporal bone normal. The tympanum contained unhealthy granulations. The aqueductus Fallopii showed a large defect in the posterior tympanic wall. The facial nerve was converted into an inflamed and red granulating mass. On exposing the oval niche, the window was found enlarged downward, containing granulations and a remnant of the stapes. The internal auditory canal and its contents appeared unaffected. External to this there was an irregular opening in the dura which had been noted at the last operation.

The fluid drawn off at lumbar puncture gave a pure culture of streptococcus.

Remarks.—At the first operation the only complication found was a defect in the aqueductus Fallopii, and an inflamed facial nerve. The pain behind the ear, of which the patient complained after the operation, was undoubtedly due to the extradural abscess, but as it seemed to diminish and was unaccompanied by other symptoms nothing was done until on the twelfth day after the first operation, when the patient suddenly became very much worse and the temperature rose to 104°, went down to 101° in the evening, and in the following day was 105.3°. The presence of an intracranial complication was now very apparent, and from the position of the pain and the type of the fever it was probably situated in the posterior cranial fossa, near to and with likely involvement of the sinus. The sinus was exposed but found healthy. A short distance internally to it a well-defined extradural collection of pus was evacuated and a small perforation found in the dura from which cerebrospinal fluid escaped. Meningitis had, however, already set in, for on the following day a paralysis of the external rectus, delirium, and other symptoms appeared. A small area of discolored bone was seen at the juncture of the inner and posterior walls of the antrum, posterior to the external semicircular canal, without any sign of a fistula, which might have been the original path of infection from the antrum. The extensive changes found on the inner tympanic wall, with the loss of hearing and absence of vertigo and nystagmus, certify a disease of the labyrinth of non-recent date. The internal auditory meatus and the other paths of infection usually traversed by a labyrinthine suppuration were unaffected.

COLLODIUM AFTER NOSE OPERATIONS.

By Dr. KASPAR PISCHEL, San Francisco.

THE after-treatment in nose operations, on the septum as well as on the turbinals, has been quite unsatisfactory to me. There was the alternative: pack the nose or take the risk of having a severe hemorrhage. To have the nose packed is exceedingly disagreeable for the patient: if the packing is loose, you may have a hemorrhage; if the packing is tight, it sometimes causes such discomfort and pain that the patients cannot sleep. I tried different kinds of packing. Iodoform gauze strips soaked in ferro-pyrine solution answered tolerably well. A surer packing against post-operative hemorrhages is compressed cotton in the form of Dr. Simpson's intra-nasal tampons, made by Johnson & Johnson. The moisture of the nose makes them swell up so that they very effectually prevent the hemorrhage, but the pressure is sometimes so great that it causes pain, discomfort, and a sleepless night. The removal of the plug also is quite painful, and several times I overlooked some layers which were pressed into the flesh; they stayed there several days, causing some infection through retention of pus. These disagreeable experiences caused me to look for a cover of the wound which would not close up the nares. I tried carbolized gelatine in 50-per-cent solution, which had served me well in small hemorrhages on the septum, but it did not prove strong enough. For the last ten months I have used collodium to my entire satisfaction. After I am through with the operation (removal of hypertrophy on lower turbinal, for example), I touch the wound several times with adrenalin to stop the bleeding; then I drop collodium on the wound, while my assistant blows compressed air into the nose to quicken evaporation. The collodium quickly forms a white firm membrane which fulfils two purposes: it covers the wound against infection from the air, and prevents secondary hemorrhages. As an extra precaution, I ask the patient to keep a little cotton in the entrance of the nose on the way home, but allow him to take it out at home, so that he may breathe through that nostril. In several cases, to facilitate the sticking, and to increase the powder of collodium, I put a wisp of cotton on the wound first; after a few days I remove this membrane, which, if left too long, might cause infection by retention.

I have now used collodium in 31 cases and have not yet had one secondary hemorrhage. At first I was afraid that collodium would smart too much, but as the nose is under cocain-anæsthesia the patient does not feel anything. The collodium must be dropped on the wound slowly and carefully, so that it does not run down into the pharynx, which would make the patient gag and cough. For dropping the collodium on the wound one might use a fine Eustachian catheter, on the wider end of which a small rubber bulb (of a dropper) is mounted, fastened air-tight with a rubber band. One filling of the bulb with collodium is usually enough to cover the whole wound. I use a small metal tube, 9 *cm* long, 1 *mm* thick, with a tulip tip on one end, to fasten the rubber bulb. This tube has to be cleaned out thoroughly after use.

IN REGARD TO A CASE OF PRIMARY ACUTE PURULENT INFLAMMATION OF THE MASTOID CELLS, INVOLVING NEITHER THE MIDDLE EAR NOR THE MASTOID ANTRUM; REPORTED BY JOHN DUNN, M.D.

E. F. SNYDACKER, M.D.,

ASSISTANT SURGEON ILLINOIS EYE AND EAR INFIRMARY.

CASES of primary mastoiditis, especially non-diabetic ones, are so very rare, and it is so difficult for us to comprehend how inflammatory agents can pass through the middle ear and antrum without exciting any reaction whatever, but fall upon the mastoid cells with sufficient violence to cause their disintegration, that each new case recorded is worthy of careful scrutiny.

In the case reported by Dr. Dunn in the June number of the ARCHIVES there are several points worthy of consideration. The author, in speaking of the tympanic membrane, says, " The drum appeared abnormally pale, of a dead white color." The malleus handle could be seen only for its upper half; the lower half seemed buried out of sight in the dead white of the drum. Farther on, " that the Eustachian tube was patent was shown by the fact that for two or three days after the operation the patient's sputum was stained with blood."

In an article by Dr. E. S. Meierhof (in vol. xxxi., No. 1, of these ARCHIVES), he divides acute otitis media into various types, illustrating these types by cases.

His type 2 he illustrates by the case of a lady fifty years old, who had severe pain, *no discharge*, little temperature, *drumhead but little inflamed or protuberant ;* and in spite of the mild involvement of the middle ear the case ran into one of mastoiditis.

Less than three months ago, I saw a case of acute otitis media, where there was absolutely no redness of the drum membrane, where the hammer handle remained visible, where the discharge was scanty and serous in character, the temperature varied from 99° to 100°; pain set in over the antrum and then extended downward and backward, soon followed by redness and œdema.

The mastoid cells were opened by Dr. J. Holinger, and were found to contain granulation tissue. This is the second case of this type that I have seen, where, in spite of an apparently very mild involvement of the middle ear, the mastoid cells have been attacked, so that I have come to fear these apparently mild and insidious attacks more than a frank typical case of otitis media.

In Dr. Dunn's case the tympanic membrane was a dull white, and only the upper portion of the hammer handle visible. Might not this picture well represent a moderate amount of swelling of the drum membrane with desquamation of the epithelium?

The Eustachian tubes were patent, as was shown by the blood-stained sputum. Might not the scanty serous discharge have escaped through the Eustachian tube, from the middle ear without attracting the patient's attention?

Certainly, under the circumstances, it is far easier for us to conceive of an atypical case of acute otitis media than one of primary mastoiditis.

HISTOLOGICAL STUDY OF TUMORS OF THE EXTERNAL EAR.

By Dr. FRANZ ALEXANDER,

ASSISTANT TO THE UNIVERSITY EAR CLINIC AT STRASSBURG.

Abridged Translation by Dr. Adolph O. Pfingst, Louisville, Ky.

(*With Plate V. of Vol. XXXVIII. of German edition.*)

According to statistics gathered by Senf,[1] tumors of the auricle constitute but 0.048 per cent. of all affections of the ear. Allowing for growths of the external ear-canal, the percentage of tumors of the entire external ear might be placed very slightly higher. The infrequent occurrence of tumors of the external ear and the fact that some of these cases, coming under the observation of the general surgeon, are not reported in otological literature, may account for the neglect of this subject by otologists. Haug is probably the only one who has devoted much study to the subject, and who has attempted to make a classification of tumors of the external ear based upon their histological structure. In this connection fifteen cases which have lately come under my observation at the Strassburg Ear Clinic may be of interest. Classified according to their microscopic structure, they are as follows:

A.—CONNECTIVE TISSUE TUMORS.

i. Fibromata, Cases 1, 2, 3, and (tuberculous granuloma) 4.
ii. Angioma cavernosum, Case 5.
iii. Endotheliomata, Cases 6, 7, and 8.

B.—EPITHELIAL TUMORS.

i. Carcinomata (*a*) of skin, Cases 9, 10, and 11.
" (*b*) of glandular structure, Cases 12 and 13.
ii. Atheromata, Cases 14 and 15.

CASE 1.—**Papillomatous fibroma molle.**

A female, thirty-seven years of age, presented a rather firm growth with smooth surface the size of a pea, attached by a narrow pedicle just behind the tragus of the right ear at the entrance of the ear canal. After its removal with the snare the normal drum-membrane became visible.

The microscope showed a normal covering of skin except at the point of attachment. The growth itself was made up largely of fibrillar connective-tissue, loose in texture and containing few cells, with interspersed blood-vessels, hair follicles, and glands.

Fibromata occurring at the entrance of the external auditory canal are very uncommon and usually have a broad base.

CASE 2.—**Cheloid of the helix.**

Male, eighteen years of age. A tumor the size of a pea, with smooth surface, was situated on the crura of the helix close to the scaphoid fossa of the right ear. The growth had developed slowly at the site of a scar, the result of a lacerated wound of the concha received a year previously.

Microscopically normal epidermal covering was seen surrounding a mass composed almost entirely of dense fibrillar connective-tissue irregularly arranged and containing but few spindle-shaped cells. This growth, a dense fibroma of the skin, should on account of its origin from scar tissue be regarded as a cheloid.

Cheloids of the auricle are rather common, occurring, however, in nearly all cases on the lobule, following perforations for the wearing of ear ornaments. No other case could be found in literature where the growth sprang from other portions of the pinna, and where there was a history of injury at the point of origin.

CASE 3.—**Cheloid of the lobule.**

A female, who four years previously had her ears pierced, and which was followed by suppuration, gradually developed a small tumor on each lobule. In three years the left one had attained the size of a hazel-nut, the right one the size of a pea. Both were abscised. They were firm, had a smooth surface due to a normal but thin covering of epidermis. The mass itself was composed of interlacing fibres of connective tissue, with few spindle-shaped cells. Some of the fibres could be traced to the surrounding skin running between the epidermis and corium.

Cheloids of the lobule are common, constituting, according to the statistics of Senf, thirty-six of forty-five cases of fibroma of the ear. They all gave the history of suppuration following piercing of the lobule.

CASE 4.—**Tuberculous granuloma of the lobule.**

A female of eighteen years, giving tuberculous family history, presented two small knotty growths about the size of a pea, one on the left lobule, the other on the left antitragus. Their origin dated back seven to eight years, and were attributed to suppuration subsequent to piercing of the lobule. Both tumors had an irregular ulcerated surface due to an eczema involving also the surrounding skin. As the growth seemed adherent to the deeper structures they were removed by amputating the lobule and tragus complete. The lungs at this time showed evidences of beginning catarrhal trouble, and the sputum contained tubercle bacilli in small numbers.

Microscopic examination.—Externally the growths had a covering of thickened, irregular skin. They were made up of granulation tissue, *i. e.*, of small spheroidal cells with an abundance of blood-vessels. Throughout the tissue numerous round areas, less intensely stained than their surroundings, could be seen. These lighter-stained areas contained a more delicate meshwork of fibrillar connective-tissue whose interspaces were filled with polyhedral epitheloid cells with delicately stained nuclei. In some of them isolated giant cells were present. There was an abscess of blood-vessels. Some of the areas, becoming confluent with their neighbors, formed larger irregular areas. Around the pale areas round cells were closely packed, forming deeply stained boundaries to the paler interior. Near the surface, just under the subepithelial adipose tissue, the beginning of a cheesy degeneration was noticeable.

Although these growths were undoubtedly made up of granulation tissue, their structure was characteristic of a specific infection. The pale areas made up of epitheloid cells, the stroma of delicate fibrous tissue all surrounded by densely packed round cells, also the absence of blood-vessels, the presence of giant cells, and the beginning caseation indicate the tuberculous nature of the tissue.

Haug[8] has reported five nodular tuberculous growths of the ear following piercing of the lobules. In two of these tuberculosis was demonstrated in other organs. He believes that the growths are due to local infection pure and simple. Whether this is true or whether the local traumatism merely brings about a more favorable condition for the development of germs pre-existing in the body is a mooted question and will need no further discussion in this connection.

CASE 5.—**Angioma cavernosum.**

In a male of thirty years a reddish-blue growth about the size of a pea, with an irregular surface and rather broad pedicle, had developed in a few weeks on the left auricle just anterior to the scaphoid fossa. The extirpated growth was found to be an angioma cavernosum. Covered externally by normal skin, the mass was divided into two halves by a septum of fibrous tissue. It consisted almost entirely of blood-vessels of various sizes separated by a variable amount of fibrillar connective-tissue containing some spindle-shaped cells. The larger spaces, representing sections of thin-walled blood-vessels, were filled with blood, while most of the smaller ones were empty. Both were lined by endothelium.

Angiomata of the auricle are very uncommon, and when they occur are usually found in the region of the tragus. Virchow has called them fissural angiomata.

CASE 6.—**Endothelioma of the lymphatic vessels.**

A male, fifty-three years old, had noticed a growth develop on his left auricle for five to six years. The tumor when seen was almost an inch long, over one-quarter inch thick, and was attached to the scaphoid fossa and the antihelix by a pedicle. Anteriorly it was confluent with the skin of the concha. The tumor was excised and in 1½ years had not returned.

The microscope showed normal epithelial covering on one side of the growth, while the fundus was denuded of skin by the ulcerative process, leaving the subcutaneous adipose tissue exposed. The tumor proper was made up of solid columns of polygonal cells separated by a stroma of fibrous tissue varying in amount. The fibrillar structure carried blood-vessels and in parts was infiltrated by small round cells. The cellular columns interlaced and anastomosed in a reticular formation. They were nowhere continuous with the epidermis or with the glands of the skin. Towards the surface of the tumor, they were narrower than in the depth and contained but one or two layers of cubical cells. They seemed everywhere to penetrate between the connective-tissue fibres, and were nowhere surrounded by a limiting or cellular membrane. In some portions of the tumor the cells had become flattened and packed together in concentric masses. They did not give the characteristic bright-red seen in epithelial pearls of epitheliomata in the stained specimen. Toward the surface of the tumor, its structure, especially the fibrous tissue, had undergone changes developing a hyaline character. It was so extensive in parts that only small fibrous bands and remnants of the tumor cells were visible. The characteristic reticular formation of the cellular columns would indicate a distribution along preformed channels. It could readily have been mistaken for carcinomatous tissue which had extended along the lymph channels, but the absence of the endothelioma around the columns would indicate that these cells had been involved in the process, or, in other words, that they had been converted into tumor cells constituting the endothelioma. The hyaline degeneration was also characteristic of endothelioma. Furthermore, there was not that irregular distribution of cellular elements as we see it in sarcoma, nor was there the abundance of epithelial pearls and strands as seen in epithelioma.

CASE 7.—**Endothelioma of the lymphatic vessels.**

A female, fifty-three years of age, gave history that a small blister had formed in left concha about a year previously. It grew for six months, then broke spontaneously, leaving a raw surface which had grown larger since. Her general health had been good.

Extending from the concha over the helix and antihelix and vertically from a level with the upper wall of the ear canal to the lobule, was an ulcerated nodular surface exposing the fibro-cartilage in parts. No enlarged glands were found. The portion of the auricle containing the ulcer was excised, including about ⅜ inch of surrounding skin, and skin sutures applied. In 1¾ years there had been no recurrence.

Microscopic examination.—Normal epithelial covering was present only at the edges of the ulcerated surface, and nowhere was there a prolongation of the epidermis into the depth. A rather extensive area of granulation tissue covered a portion of the ulcerated surface. The pseudoplasm itself, occupying the deeper layers of the skin, was composed of reticular formations of columns of cells and of dense concentric masses very much as in Case 6. The columns, which predominated nearer the surface, were composed of two to five layers of cells, principally cubical in shape. The concentric masses were most abundant nearer the centre of the tissue and contained cells varying from elongated and cubical forms to the flattened, squamous variety. In some of the columns a narrow lumen was visible. Around the columns was a stroma of fibrillar connective-tissue partly infiltrated by small round cells. Throughout the tissue, but more especially near the surface in the cellular columns, hyaline degeneration had taken place. It may also be mentioned as a noteworthy feature that the cell clusters and columns were separate and well defined and that they were nowhere continuous with the epidermis or glands of the skin. This would exclude the probability of carcinomatous extension along the lymph channels. The absence of endothelial tissue around the columns was additional evidence of the nature of the tissue. The columns were in direct contact with the fibrillar connective-tissue.

CASE 8.—**Endothelioma of the lymphatic vessels.**

This specimen was taken from the pathological collection of Professor v. Recklinghausen and not accompanied by clinical data. A large tumor occupied almost the entire auricle extending backward to the occiput and encroaching upon the squamous region above. It measured three inches in its longest diameter, and was raised about ⅜ inch above the surface of the skin. Its surface was uneven, almost papillomatous. Microscopic sections were made from different parts of the growth. The skin over most of the region involved by the tumor was denuded by an ulcerative process and replaced in parts by granulation tissue.

Where normal skin remained intact it covered the tumor proper —only a narrow zone of round cells separating them. The tumor was made up principally of cells with little intercellular substance arranged in a characteristic manner. In some portions a delicate fibrillar network arranged the cells in irregularly round masses. In the major part of the tumor the cells were packed into dense columns or pillars, separated by a delicate fibrillar structure. The columns varied in thickness, the narrowest containing but one or two rows of elongated cells. These narrow strands dwindled down to thin cords which finally terminated in connective tissue. Some of the larger columns contained a central lumen, cross-sections having the appearance of rings of cells. Others again evidently occupied but a portion of the lymphatic vessels from which they took their origin, leaving the endothelium opposite their origin intact and separated from the tumor mass by a narrow elliptical space. Otherwise no trace of endothelial cells was visible. The cells of the growth were variously shaped, polygonal and cubical forms with homogeneous protoplasm and large nuclei predominating. In the smallest columns the cells were very low, almost resembling squamous cells. In some portions of the tumor giant cells with seven or more nuclei were present, while cells undergoing kariokinesis were abundant throughout. Scattered areas of degenerated tissue (hyaline) were noticeable throughout the tissue, though the process was not near as extensive as in Cases 6 and 7.

But few cases of endothelioma of the ear have been reported. It is very probable that, as Kümmel[3] suggests, many cases have been overlooked and we shall find that endothelioma of the ear is a much more frequent affection than is usually believed. They were formerly described as sarcomata.

The only two cases of endothelioma of the auricle which could be found in literature were both reported from the Strassburg clinic.[4] One case of endothelioma of the ear canal has also been reported.

Volkman,[5] in his exhaustive article on endothelioma based on records of 54 cases, has emphasized the importance of making a sharp distinction between endothelioma and other malignant growths. Although endotheliomata closely resemble other epithelial tumors in their histological make-up, their genetic aspect must also be taken into consideration. In tumors which have not taken their origin from endothelial cells, but merely extended along the lymphatic channels, it is nearly always possible in specimens hardened in alcohol to find the shrunken tumor tissue within the lymphatic vessels characterized by their endothelial lining.

CASE 9.—**Flat-celled carcinoma.**

Male, seventy-six years old; had six months previously noticed a small blister at the edge of left concha. Since then the surrounding parts became swollen and the surface reddened. At the upper termination of the helix a small warty growth was present, from which a moist ulcerated surface extended downward and forward into the concha. No enlarged glands were found. The upper two-thirds of the auricle was amputated, including a strip of normal skin around the ulcer. Skin edges were sutured. No return was reported in 2½ years.

Microscopic examination.—Portions of the epidermis over the involved area were intact, the largest portion being denuded in irregular patches from which sprang masses of granulation tissue. The epidermis near these ulcerated areas was prolonged in bands towards the deeper parts of the cutis, some of them reaching as far as the cartilage beneath. Beneath the ulcerated areas normal tissue had been replaced by densely packed strands and concentric masses of cells. They were irregularly arranged and could be traced to the epidermis, with which they were continuous. Between the conglomerate masses of cells there was a rather abundant supply of connective tissue infiltrated with small round cells. The spheroidal masses were composed of polyhedral cells containing large nuclei. In many of them they were arranged in a concentric manner, becoming flatter as they approached the interior. The centres of the spheroidal clusters were homogeneous in appearance and were made up of degenerated flattened cells. Cells at all stages of cell-division were present throughout the growth. A histological condition worthy of note was the cylindrical arrangement of the tumor-cells in portions of the growth with a homogeneous membrane lined by endothelial cells surrounding them.

This was a typical case of flat-celled carcinoma (epithelioma). The characteristic cells and their arrangement and the connection with the epidermis were evidence of its origin, while these characters and the tendency to invade the deeper structures, the lymphatic vessels filled with cells, the absence of endothelial cells, and the infiltration of the stroma were evidence of the nature of the tissue.

CASE 10.—**Flat-celled carcinoma.**

Male, seventy-six years old, presented an ulcer about an inch long and ¼ inch wide situated at the posterior surface of the left concha, close to the helix, that had developed in six weeks. The tissue was raised about ⅜ inch above the skin surface; its edges thickened by infiltration. No enlarged glands were found. This patient gave a history of having frequently had his ears frost-bitten. The growth was removed by amputation of the entire upper portion of the auricle. After 1½ years no recurrence had taken place.

Sections were made transverely through the mass for microscopic study. The epithelium on the back of the entire helix and its immediate surroundings had been destroyed. From the epithelium just surrounding these denuded areas strands of epithelial cells projected into the cutis. Between the strands of cells an infiltration of small round cells had taken place. At the ulcerated areas on the helix the skin had been replaced by carcinomatous tissue composed of spherical concentric masses and irregular interlacing columns of cells, the latter being continuous with the epidermis of the surrounding skin. In some portions the cancerous tissue had invaded the cartilage beneath. The cells of the pseudoplasm were mostly polyhedral. In many of them kariokinetic figures were observed.

This growth was so similar to the one of the preceding case that a lengthier description is unnecessary.

CASE 11.—**Flat-celled carcinoma.**

A female of sixty-five years complained of having had a sore place behind her left concha for about six months. She presented an ulcerated moist area extending over the lower half of the posterior surface of the concha, reaching from the helix to the integument over the mastoid bone. The growth was but slightly raised above the surface. It was thickened at its edges. The thinner central portion was ulcerated and covered by a yellowish secretion. The diseased area covered about 2½ inches in one direction and two inches in the other. In front and a little below the ear there was an enlarged lymphatic gland about the size of a hickory-nut. The diseased area was removed by amputation, including enough healthy skin to insure the removal of all diseased tissue. The skin was united by sutures. The patient died of other troubles a year later. There had been no return of the cancer at the time.

Microscopic examination.—A large portion of the mass was covered by skin which had undergone extensive changes, the epithelial cells having multiplied and extended in bands or columns deep into the surrounding tissue. All characteristic structures of the skin had been destroyed. The tissue in the depth was made up of columnar and concentric masses of cells irregularly arranged and separated by connective tissue which was infiltrated by small round cells. The columns were continuous with the cellular strands extending from the epidermis. At some parts of the tumor no epidermis was visible, the conglomerate mass of columns and spheroidal bodies coming to the surface, where it was covered only by a narrow zone of fibrin and small raised cells. In parts, small areas of normal skin were intact. The character of the cells of the growth differed at different portions of the tumor, being principally polyhedral near the ulcerated surface and flatter towards the centre. The flat cells formed a number of pronounced epithelial pearls characterized by their bright red color when stained with hæmatoxylin and eosin. As in the previous cases, this growth also had the typical histological structure of an epithelioma, which will not need further elucidation.

Considered from a clinical standpoint, the three cases presented some points of interest. They all ran a typical course, two of them beginning in a blister from which the ulcerated area developed. One of the cases only could be traced to external influence for its cause (frost-bite). A noteworthy fact was the involvement, in all of the cases, of the helix, which corroborates the observation of Zeroni,[6] that the helix is the most frequent seat of cancerous growth of the ear. He attributes this to senile degenerative changes of the epidermis at this, the most exposed, part of the ear. The tendency to destruction of the cartilage is another characteristic of epithelioma of the ear, which was pronounced in the three cases described. In thirteen cases Heil[7] found the cartilage normal but twice.

CASE 12.—**Cylindrical-celled carcinoma.**

Male, fifty-four years of age. Three years previously he had a sero-sanguineous discharge from the right ear followed soon afterwards by the appearance of a warty growth at the meatus. This was removed and the base cauterized. Four months later several other smaller growths were removed from the canal, and in seven additional months the entire canal was curetted and cauterized on account of recurrence of the growths. Notwithstanding this a nodular growth rapidly reappeared, which soon filled the ear canal and extended behind the auricle. When first seen a soft mass of a dirty brown color completely filled the ear canal and a nodular tumor about the size of a walnut, of bluish-red color, was present behind the ear, resting on the mastoid process. This tumor was movable over the subcutaneous tissue. It bled upon touch, as did the mass in the ear canal. Just below the mass behind the ear a fistulous opening led into the depth. A probe passed into it came in contact only with soft tissues. A foul discharge exuded from the ear canal. Beneath the ear was an enlarged lymphatic gland. The entire ear portion of the parotid gland and the soft parts of the ear canal were removed and left to heal by granulation. During the process of healing several small nodes reappeared on the surface and were removed. A few months later there was a recurrence of the growth, which ended fatally in nine months.

Microscopic examination.—Normal skin covered most of the tumor, but nowhere had there been an extension of the epithelium into the depth. The growth proper was situated principally in the deeper layers of the skin and the subcutaneous structure. It was made up of masses of epithelial cells and a fibrillar stroma. The fibrous bands of the stroma were irregularly distributed, forming variously shaped spaces filled with cells. Some of the masses thus formed were spherical, others lobular, while others were arranged in elongated masses. Some of the spheroidal clusters were characterized by a darker outer zone and a paler zone interiorly. In the outer zone the cells, more densely packed than those in the interior, were cubical and polyhedral in shape. The cells in the interior had by mutual pressure assumed irregular shapes. In some parts the interior cells were polygonal, resembling the cells of the sebaceous glands of the skin. In other parts again the interior of the spheroidal masses contained no well-defined epithelial cells at all, the tissue being composed of a fine fibrillar network in the meshes of which were old broken-down cells and a few scattered round cells. There were some masses also in which there was no apparent difference between the outer and the inner portions, the cells being distributed irregularly in a delicate reticulum of connective tissue with round and spindle-shaped corpuscles. The cells in the different clusters all had large vesicular nuclei. In some places the cancerous tissue had penetrated the cartilage. In the cartilage not directly involved the cells had lost their nuclei, the cartilage appearing granular in construction.

This tumor, composed of epithelial concentric and variously shaped masses, surrounded by a fibrillar stroma, no communication between the cells and the epidermal cells having been established, would indicate the glandular origin of the growth, the nature of the cells in some portions indicating its origin from the sebaceous glands of the skin.

Tumors of this kind occurring in the external ear-canal are very uncommon. Kümmel cited two such cases reported by Klingel,[8] and one was observed by Haug.[9] Though Haug was unable to decide whether his case was a simple adenoma or a malignant growth, the degenerative change of which he speaks in his report would rather indicate its malignant character. Denker[10] and Manasse[11] reported similar cases. In my case there could hardly be a doubt of the nature of the growth.

CASE 13.—**Cylinder-celled carcinoma.**

An old lady past seventy, after having a watery discharge from her left ear for two or three months, developed a small growth in the external ear-canal, followed very shortly by a similar growth over the mastoid. Both tumors were removed with a curette. Three years later there was a recurrence of the growth. When seen, a mass as large as a pigeon-egg projected from the meatus. It had a fissured, partially ulcerated surface. It not only filled the concha, but encroached upon the parotid below. The parts involved were removed. The patient died five years later of some other trouble, at which time a recurrence had not taken place.

Microscopic examination.—The epidermis wherever present was very thin, and from it a few isolated short strands projected into the deeper parts. The tumor proper was made up of a conglomeration of variously shaped masses of cells, many of which were lobulated. Between these masses and surrounding groups of them was a rather vascular fibrillar tissue infiltrated with round cells. Some of these masses, as in the preceding tumor, had a cortex of columnar cells, the central cells having become irregular by mutual pressure. In most of the masses, changes had taken place in the interior, many of the cells becoming vacuolated. In others, again, the stroma had become more plainly visible than in the others, enclosing in their meshes broken-down non-nucleated cells, a few epithelial nuclei, and round cells. Another peculiar variety of cell clusters were those in which the connective tissue was vacuolated and continuous peripherically with the protoplasm of the peripheric cubical cells. As in the preceding specimen, no connection existed between the tumor and the epidermis. The lobulated arrangement of the cellular masses and the cylindrical cells indicated its origin in glandular structure. The conglomeration of cells in the interior, with interlacing infiltrated stroma and the evidence of degeneration were signs of its malignancy. The absence of the polygonal cells characteristic of sebaceous glands would indicate its origin in the other glands of the skin of the ear canal — the ceruminous glands.

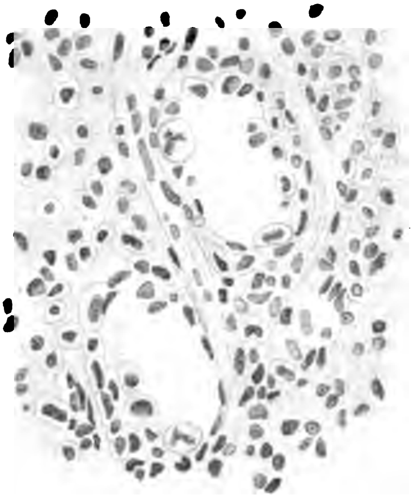
Cases similar to this one have been published by Treitel[12] Jurka,[13] and Haug.[14]

CASE 14.—**Atheroma of the lobule.**

A male, forty-six years old, presented a fluctuating tumor the size of a goose-egg attached to the lobule of the right ear. The growth began twenty years previously, but had caused him no inconvenience until recently. The tumor was attached to the anterior and posterior edges of the lobule, and rested upon the skin of the neck behind the lobule. The surface was smooth and apparently covered by skin. The tumor was severed from its attachment and the skin edge sutured. The growth measured 3+2½+2 inches. A thin pultaceous mass occupied its interior.

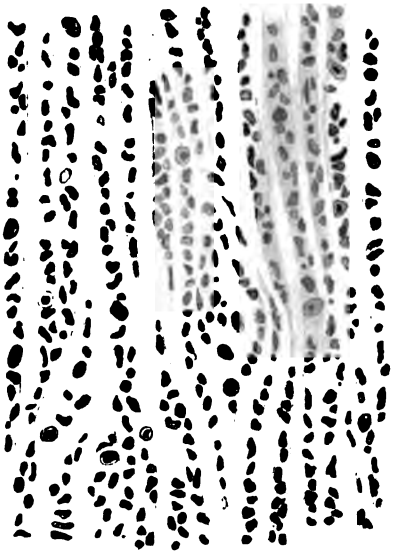
The microscope revealed a normal covering of skin under which there was a capsule of coarse fibrillar connective-tissue carrying blood-vessels and infiltrated by round cells. It was lined with flattened epithelial cells mostly without nuclei. The pultaceous contents contained cholesterine crystals, exfoliated epithelial cells, and oil globules, but contained no hairs. This was a clear case of atheroma.

Fig. I.



Zeiss Ocul. 4. Syst. DD.

Fig. II.



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F. Kretz del.

Lith. Anst. v. C. Kirst & Co. Leipzig

Verlag v. J. F. Bergmann, Wiesbaden

Such tumors are not infrequently found springing from the auricle. Oftener than is generally believed, many of these cases are treated by the general surgeon and escape the observation of otologists. The noteworthy feature of our tumor was its size. The only other large one of the kind, whose size was compared to that of an apple, was reported by Gruber.[15] They are usually about the size of a pea.

CASE 15.—**Atheroma in auditory canal.**

A clerk, eighteen years of age, had some time before applying for treatment been unable to hear well with the right ear, though he had suffered no other inconvenience. Springing from the upper wall of the ear canal was a small tumor. It almost occluded the canal. It was removed by incising the skin and peeling it out. The skin was sutured. The tumor had a delicate capsule which was filled with a pultaceous mass.

Microscopically the capsule was seen to be composed of fibrous connective-tissue which in parts had a hyaline appearance and contained few cells. On its inner surface numerous exfoliated flat cells were seen — most of them without a nucleus. The contents of the sac had the same make-up as that of Case 14. It contained no hairs.

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ON THE LOCAL ACTION OF TRI-CHLOR-ACETIC ACID.

By Dr. HUGO SCHWABE,

ASSISTANT IN THE AURAL DEPARTMENT OF THE ALLERHEILIGEN HOSPITAL, BRESLAU.

Abridged Translation by Dr. Carl Mund, New York.

IN order to gain a thorough and correct knowledge of the therapeutical value of a drug, it is absolutely necessary to combine clinical observation with clinical experiment, instead of depending on the former alone, as is usually done. Clinical experiments must be made on tissues of analogous structure. The anatomical relation of the tissues of the nose, especially those of the turbinated bodies, requires special consideration in testing the local action of therapeutic agents in regard to their efficacy and limit of action.

The treatment of chronic hypertrophic rhinitis has for its chief aim a reduction in size of the hypertrophied turbinal. This may be accomplished by means of cutting operations, viz., scissors and snare, by the galvano-cautery, and by chemical caustics. The latter, in general, have a superficial action, inasmuch as they at once coagulate the organic albumen on the surface of the turbinals, thus forming insoluble and inert combinations. The volume of a hypertrophied inferior turbinal cannot be reduced in size by any therapeutic agent which has not the property of penetrating sufficiently deep to reach the erectile tissue proper.

Tri-chlor-acetic acid which, since its reintroduction by von Stein, is being extensively used for the treatment of hypertrophied turbinals, lacks entirely this property of sufficiently deep action. The numerous articles written on the subject advocating the use of the acid clearly demonstrate the insufficient deductions drawn merely from clinical observation. They contain striking contradictions, inasmuch as they advocate the use of the acid for different pathological processes. On the one hand the acid is claimed to have the power of effecting the closing of old perforations of the tympanic membrane by destroying the epithelial layer covering the margin of the perforation, without having any effect on the underlying substance of the tympanic membrane. In this case the necessary therapeutic effect is dependent on the absence of any deep or penetrating action. On the other hand, the acid is said to be a valuable substitute for the galvano-cautery in the treatment of hypertrophied turbinals. In this case a deeply penetrating action on the hypertrophied tissue, and far beyond the region ever reached by the acid, would have been necessary. These striking contradictions induced us, during a course of experimental investigations relative to the mode of action of the various cauterizing agents, the galvano-cautery, etc., on the nasal mucous membrane, to study also the action of the acid on this tissue.

Thus far experiments on the action of tri-chlor-acetic acid on mucous membrane have been made by Schujeninoff[1] only. He used as material the tongue of a dog; twenty-four hours after the application of the acid, the mucous membrane showed intense inflammatory reaction.

Clinical reports on the action of the acid on the nasal mucous membrane uniformly speak of the characteristic total absence of inflammatory reaction. Ehrmann recommended the acid not only for the treatment of hypertrophied turbinals, but also for that of hypertrophied tonsils, praising the powerful local action with its but slight inflammatory reaction. Killian, more sceptical in his opinion in regard to the action of the acid, advises to apply the fluid acid by means of careful and repeated rubbing, but states that in cases of very marked hypertrophied inferior turbinals the use of the snare is more appropriate. Favorable reports were published by von Szoldrski, Cholewa, Lynker, Winkler, with the description of special instruments for applying the pure acid. On the other hand, von Réthe does not believe that the caustic action of the acid can be localized, and states that he has often observed severe inflammatory reaction.

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[1] Ziegler's *Beiträge zur pathologischen Anatomie*, vol. xxi., 1897.

The microscopical investigations of Schujeninoff show a marked caustic effect extending almost as far as the muscularis, *i. e.*, through epithelium and subepithelial connective tissue; three days later, deep defects with microscopical signs of a most intense inflammation, viz., dilated, partly thrombosed vessels, the leucocytes adhering to the margin of the vessels; accumulation of leucocytes with fragmented nuclei in the connective tissue of the mucosa and the muscular layer.

In these experiments the intensity of the caustic effect is far more marked than that which we obtain by applying the acid to the nasal mucous membrane. In the latter only superficial scabs are formed, without deep defects in the nasal mucous membrane. Our clinical experiments, which show the absence of any marked reaction, prove that the effect of the acid on the human nasal mucous membrane is very different from that obtained by experiments on animals.

The results of our experiments are as follows:

In the experiments on animals a slender cotton tampon saturated with pure fluid tri-chlor-acetic acid was introduced into the nose of a four-months-old rabbit, and rubbed into those parts of the nose which could be reached directly. By the pressure exerted with the tampon the acid also came in contact with parts of the nose which had not been directly touched. From five to forty-eight hours after the cauterization the rabbits were killed, the removed portions of the mucous membrane fixed in sublimate-common-salt solution, hardened in alcohol, imbedded in celloidin, and the sections colored with hæmatoxylin-eosin and hæmatoxylin (van Gieson). The parts into which the acid had been rubbed directly exhibited the following appearances: The epithelial layer and the uppermost layers of the mucosa had been destroyed; they formed a crumbling mass in which a tissue structure could no longer be distinguished.

The layers of the mucosa adjacent to this region showed relatively few small-celled infiltrations, and also few extravasations; the capillaries were well filled. In those parts, however, which had not been directly touched by the tampon there was only a caustic effect of the uppermost layers of the cylindrical epithelium. These quantitative differences in the deep action of the acid, depending on whether we allow it to act merely chemically or whether we assist it in a mechanical way, show that a good part of the extensive destruction is due to mechanical influence. I again call the attention here to the experience of Killian, who advised to increase the action of the acid by rubbing. Very likely the chemical effect of the acid on the deeper parts depends on the mechanical irritation.

In experimenting on human mucous membrane, the point was to see to what possible depth the acid could penetrate. These experiments were performed on excised fresh mucous membranes. Sections of hypertrophied turbinals were cauterized with tri-chlor-acetic acid immediately after excision, placed in sublimate-salt solution and treated in the manner heretofore described. In these only the upper layers of the epithelial cells were found affected; the basement membrane remained intact and was usually covered by one or more layers of undisturbed epithelial cells. The action of the acid had always ceased at the glandular ducts.

The openings of the glandular ducts were apparently rapidly closed by the caustic action and thus rendered impermeable.

The epithelium in the depth of the ducts and that of the follicles always remains intact.

In order to study the intensity and the range of the caustic effect on living tissue, and also the intensity of the reactive processes, further experiments were conducted in such a manner that the hypertrophied turbinals were cauterized with tri-chlor-acetic acid in the ordinary routine way; from within twenty-four hours to several days afterward the cauterized turbinals were removed by means of the scissors, and prepared as before for microscopic examination. The results were as follows: Only the uppermost layers of the epithelium were destroyed, whereas the deepest layer of cells above the basement membrane, in some cases even two or three superimposed layers, were intact. The scab, containing a few leucocytes, covered the openings of the glandular ducts and also the depressed epithelial crypts, the latter being completely intact in their deeper layers. In parts excised, two or three days after the cauterizing, the scab had loosened and partly separated. In consequence of the superficial action of the acid reactive processes are marked only in the superficial tissue layers of the turbinals and to a relatively slight degree. Under certain circumstances, owing to the variable development of the subepithelial adenoid layer, it may be difficult to correctly determine the significance here of small-celled infiltrations, especially at later stages. At first it appears as though the cauterization were followed by a somewhat increased migration of polynuclear leucocytes through the epithelium. On the second and on the third day a more active subepithelial infiltration of leucocytes is observed. By that time the emigration through the epithelial layers has ceased entirely, while physiological passage of lymphocytes may be distinctly noticeable in the neighborhood of the cauterized region. The tracts of the physiological emigration in the epithelium and the opening of the glandular ducts appear to have been closed by the cauterization at the same time with the destruction of the superficial cell layers. The emigration ceased so abruptly in the cauterized region, that the possibility of a somewhat deeper extending action of the acid would appear to be admissible. The basement membranes within the cauterized region do not show the interruption by emigrating lymph-cells which otherwise is so characteristic. There is no microchemical reaction by means of which the presence of the acid or any of its compounds can be detected in tissue. Corresponding to the small area of the inflammatory exudation, the vessels located on the surface of the cauterized region show little change. No extravasations or thrombosis could be observed, except those resulting from the mechanical lesion in the process of removing the turbinals; the vessels in the whole cauterized region only appeared more filled. No changes whatever were noticed in the capillaries and veins.

The opinion advanced by von Réthe "that the action of the acid extends beyond the limits of its application," and "that the scab dissolves and the action of cauterization cannot be localized," was not confirmed by the results of our investigations. Unless too much acid is applied, *i. e.*, if the cauterization itself is well localized, the action will be limited to the cauterized region, or extend only a little beyond it.

The application of tri-chlor-acetic acid has also been recommended for the purpose of reducing hypertrophied tonsils. In this case, however, even the most energetic chemically caustic process will hardly avail to produce a noticeable reduction of a true hypertrophy. Our experiments on tonsils fully confirmed our experience with turbinals. In the latter it may be taken into consideration that when the turbinals are in a filled condition, some influence may be communicated by the nerves which cannot be observed by experiments. There is no possibility, however, of an essential effect of the acid on the tonsils, although the size of the latter depends on all such influences. By the application of the acid in this case we obtain an effect which, as a rule, we try to avoid, in order to protect the tonsils against infection, viz., the destruction of the superficial epithelial layers which take no part whatever in the hypertrophy.

All our experiments, therefore, agree on the one result which also corresponds with our clinical experience, viz., tri-chlor-acetic acid when applied to the mucous membrane of the nose or the tonsils produces a superficial effect, which does not extend to the deeper layers of the cellular tissue, unless the action of the acid is supported by mechanical measures. It is futile to attempt to obtain a permanent reduction of hypertrophic turbinals or tonsils by means of cauterization. Owing to its property of destroying the epithelium, it is an excellent means of producing this effect, as in cases where the peculiarity of the anatomical substrata requires such action, *i. e.*, in closing old perforations of the tympanum.

Galvano-caustic scabs are favorably influenced by the application of tri-chlor-acetic acid. It may be possible that an important part is played here by the property of the acid to form a solid compound in contact with the tissue which, while extending uniformly over the cauterized region, leads to a closing of the openings of the epithelial crypts, glandular ducts, etc. In tissue layers, necrosed by cauterization, the normal protective agents, which otherwise prevent infectious material contained within the nose from entering into the tissue, are effective only to a slight degree, if at all. The later application of the tri-chlor-acetic acid seems to take the place of a protective bandage, inasmuch as by forming a uniform protective layer it prevents the settling and development of those bacteria which have entered the nose within the region deprived of its physiological protection.

This property of the acid to induce, without any irritation, the closing up of all the channels discharging from the surface of the turbinals renders it applicable in the treatment of hay fever. Guided by the results obtained in our experiments, we have applied the acid in numerous cases of nasal hydrorrhœa. The result fully corresponded to our expectations, and our favorable experience has also been confirmed by the reports of Jurasz.

This is not the place to refer to the different theories on the nature of hay fever, but whatever opinion one adopts, it must be admitted that tri-chlor-acetic acid theoretically combines all those properties to attack this disease in two of its most important points, viz.: it is non-irritating and provides a uniform protective layer; and, on the other hand, it mechanically confines the hydrorrhœa by closing the glandular ducts in the epithelium, and perhaps also in the basement membrane. The real nature and cause of the serous excretion in hay fever is as yet unknown. Possibly it is due to an increased transudation of lymph in the ducts in which normal lymph, as a rule, is discharged from the glandular ducts of the tissue to the surface of the nasal mucous membrane. The closing of these ducts would be an important therapeutical result to be desired. The acid apparently enters into combination with the albumen of the glandular duct secretion, and thus prevents the fluid from being discharged for several days. With the removal of the scab the effect of the application ceases, and the treatment has to be repeated in the same way.

ABSTRACTS OF PAPERS READ AT THE MEETING OF THE AMERICAN OTOLOGICAL SOCIETY AT NEW LONDON, JULY 15, 1902.

The cardiac effect of operations upon the middle ear.

Dr. H. O. Reik, of Baltimore, referred briefly to the condition of syncope or heart failure, which so frequently accompanies even minor operations upon the tympanic membrane and which is sometimes serious and always annoying. The generally accepted explanation of this faintness has been that it was due to excessive pressure upon the membrane and its transmission through the ossicles to the internal ear. After stating his reasons for believing that this explanation was applicable to only a limited number of cases, the author described a series of experiments which he had conducted in the Physiological Laboratory of the Johns Hopkins University to determine whether mechanical stimulation of the tympanic membrane had any effect upon the heart.

The means employed consisted in the use of the kymographion to record variations in the blood pressure and pulse rate of dogs while operations were being performed on the membrane. These records were exhibited to show that mechanical irritation with blunt instruments or any cutting operation upon the membrane, or disturbance of the ossicles, always resulted in a prompt and marked fall in blood pressure and a change in the pulse rate. If the animal was profoundly anæsthetized, no cardiac effect could be induced by such manipulations. If local cocaine anæsthesia was relied upon, there was still a slight fall of pressure, occurring less promptly but recovering with equal slowness.

The conclusions were: that the heart failure which attends operations upon the tympanum is due to irritation of the sensory nerves and a disturbance of the vaso-motor apparatus; that these nerves, when stimulated, always show a depressor effect and usually a cardio-inhibitory action ; that complete anæsthetization prevents and partially weakens the transmission of such an influence by these nerves. It was pointed out that stimulation of a sensory nerve usually causes a rise of blood pressure and the only other known exception to this rule is found in the nerve supply of the testicle.

Trauma in relation to exfoliation of the adult labyrinth.

Dr. B. A. RANDALL, of Philadelphia, reported a case in which suppuration following eight months after injury in a railroad wreck, with severe and long-continued suffering, unrelieved by two superficial operations on the mastoid, was controlled by removal two years later of most of the labyrinth as a smooth, rounded sequestrum. The patient had slight glycosuria, but no diabetic symptoms or constitutional disease; was incapacitated by vertigo from the time of the injury, but seemed to have no thought of damages until a year after the accident. Called as an expert witness in the suit, Randall had been surprised at the rarity in literature of exfoliation of the adult labyrinth and at the frequent association of trauma and delayed secondary inflammation, and collating this with the cases of fracture of the petrous pyramid, he was forced to the conclusion that the injury was not only possibly but probably responsible for the result. He called attention to the exaggeration of the influence of diabetes upon caries of the temporal bone, few autopsies showing it and few aurists of even large experience having reported so much as a single case. A hundred cases of labyrinth exfoliation were cited, of which forty were in adults, but most of them were loss of a mere cochleal fragment.

What means, other than operation, have we for preventing and combating inflammation of the mastoid cells? By Dr. SAMUEL THEOBALD, of Baltimore.

In the treatment of aural diseases, especially of otitis media and mastoiditis interna, too great reliance is placed in local measures, operative and otherwise, and too little thought given to internal medication. For instance, the antiphlogistic value of energetic purgation, especially when calomel in liberal proportion forms an ingredient of the purgative employed ; the efficiency of pyrophosphate of soda administered in full doses (twenty grains every two hours for an adult, ten to fifteen grains as often for a child), in controlling suppurative processes, whether located in the ear or elsewhere, and the value of mercury, given in such manner as to produce its specific effect upon the system, in the early stages of inflammation of the mastoid cells. This should not be a matter of surprise, since the membrane which lines these cells is periosteal as well as mucous, and an inflammation beginning here as a simple catarrhal process may soon become an actual periostitis.

In the early stages of otitis media, an application should be made to the ear of an oily solution of the alkaloids of atropine and cocaine (atropia gr. ii., cocaine gr. iv., ol. amyg. dulc. ℥ ss., six to ten drops to be poured into the ear three or four times in twenty-four hours), and, unless distinctly contra-indicated, a brisk calomel purge; when necessary, these remedies can be followed up with pyrophosphate of soda in the doses mentioned. In this way the attack can frequently be cut short before the stage is reached when a spontaneous perforation of the tympanic membrane may be expected or an incision required. When otorrhœa is present, the ear is syringed two or three times a day with a saturated solution of boracic acid, or a 1 to 8000 or 1 to 4000 sublimate solution, the former in acute and the latter in chronic otitis media.

In the early stages of mastoiditis interna, the same measures are employed, and, in addition, mercury is given in suitable doses instead of, or after, the pyrophosphate of soda. These energetic measures frequently suffice to control the inflammation and do away with the necessity of operation upon the mastoid process, if resorted to in the incipient stage of the attack. When the mastoiditis is due to a pneumococcus or a streptococcus infection, the progress is, of course, less favorable, and an operation more likely to be required.

A case of sarcoma of the temporal bone. By Dr. CHAS. J. KIPP, of Newark, N. J.

A boy of five years had measles without ear symptoms some time ago. A month before he was seen (March 16, 1900), the ear was very painful, and the mother syringed it out. Three weeks later she noticed in it a fleshy mass, which has steadily increased. Dr. Kipp found the canal completely filled with a mass appearing like an ordinary polypus. Pressure brought forth offensive purulent fluid. He snared off the growth, which seemed attached to the posterior part of the lower wall. Considerable hemorrhage, which was stopped by plugging. The next day, on careful exploration, he found a large hole in the lower osseous wall, close to the tympanum. The latter was deep red, not swollen, with a small hole in the posterior half. The ear appeared to be totally deaf, perceiving, however, the vertex tuning-fork better than the other ear. A probe passed through the hole in the osseous canal downward and inward, and liberated much purulent fluid. The region over and below the mastoid was swollen, red, and baggy, but not fluctuating. No swelling of glands. Under the impression that he had to deal with a suppurative otitis media with extension to the mastoid, the Doctor (March 17, 1900) proceeded to make an *ordinary mastoid operation.* A large cavity below and before the tip was full of large greenish granulations, and extended far inward toward the pharynx. The surrounding quite soft bone was removed with the sharp spoon as far as it appeared diseased, which composed nearly all of the lower, posterior, and upper walls of the ear canal. The mastoid antrum and the tympanum were one cavity. After it was thoroughly cleansed of granulations, it was packed in the usual way. Nothing noteworthy occurred during the first four weeks, except an unusually rapid and profuse growth of granulations from every part of the wound, not materially checked by nitrate of silver and the galvanocautery. On May 16, 1901, a second operation was done, without any benefit. The temperature was never over 101°, most of the time it was normal. At the beginning of June, the patient complained of headache and pain in his ear, which nothing but the free use of morphine allayed. In a few days paralysis of the facial followed, and optic neuritis made its appearance in both eyes, which up to that time had showed no abnormity. The growth increased steadily, the boy lost flesh, he was sent home, and died about three months later.

The tumor, removed after death, weighed 6½ pounds and measured 25 inches in circumference.

Dr. Kipp said that he had operated on several other cases which presented the same clinical features, but in none of them, to his knowledge, had the disease returned. He had been struck, at the first operation, with the peculiar greenish color and large size of the granulations, to which he called the attention of his assistants, and put them aside for microscopic examination, but unfortunately they were thrown away by one of the nurses before the end of the operation. The examination of bits which had been preserved at the first operation was very unsatisfactory. They had consisted of small round cells, with little outer cellular tissue. The masses removed at the second operation left no doubt as to their sarcomatous nature.

Dr. T. R. POOLEY, of New York, read a short paper on **Stacke's operation.**

The object of the paper was to support the contention that the so-called radical operation for the cure of chronic otorrhœa was done too often and without proper discrimination.

In support of this argument, the dangers inherent in the operation were enumerated, *i. e.*, the wounding of the facial nerve, dura, lateral sinus, and semicircular canals; and when the walls of the tympanum were thinned from necrosis, the internal carotid and jugular vein, being imperfectly protected, were liable to be opened. Again, in enumerating the objections to the operation, it has to be considered that it often has to be repeated several times to be sure of a complete cure; the length of time required for the healing process, and the possibility of permanent impairment of hearing in patients who, before the operation, could hear fairly well.

In conclusion he stated his views as to when the operation should be done.

The objective symptoms grouped under two forms: In a case of re-infection or of rapid extension of a chronic otitic process, or whenever a grave complication is threatened, the indication is for immediate operation. The indication is not immediate when the patient suffers little or no pain, when there is no striking symptom in the mastoid — in short, only chronic otorrhœa; but even here it may be indicated if the lesion of the bone is extensive.

Subjective symptoms: A persistent and recurrent pain in the ear or mastoid, with persistent localized pain in the parietal or occipital region, increased by percussion, vertigo, continuous or intermittent, well marked brain symptoms, such as headache, heaviness, torpor, loss of consciousness, nausea, etc.

Dr. HERMAN KNAPP reported a **case of word-deafness and word-blindness.**

The patient, a lawyer, had been under his care for progressive deafness, off and on for from fifteen to twenty years. May 18, 1900, in his forty-eighth year, he came to him with an entirely different disease. In April, 1898, he had a right-sided hemiplegia, for which he was treated in the New York Hospital. His sight and hearing were as good as before, but he could neither speak nor write for a year, when speech and writing gradually returned.

He fails to pronounce correctly long words, has to repeat them, particularly the last syllables, to correct errors. In writing it is the same. If told to write "San Francisco" he writes "S n Fr......," hesitates, and gives it up. His memory is constantly at a loss. He has forgotten his alphabet, but can read words—he is letter-blind, but not word-blind. If I wrote a word in spaced letters, for instance "g o o d n e s s," he could neither spell nor read it, but if I wrote the letters connected, "goodness," he read it at once. When I gave him a book, he read some words which were familiar to him, and therefore their memory pictures had not yet faded, he read them right off,—for instance, "gentlemen of the jury." As he was not a musician or a singer I did not analyze his qualitative hearing capacity for pitch and timbre, by the failure of fundamental tones or of one or more harmonics. The anomalies in the visual and auditory memory centres will no doubt show analogical conditions.[1]

Observations on anæsthesia of the drum membrane. By Dr. George B. McAuliffe, of New York.

The dermal layer is only a shield. It has little to do with sensitivity as shown by the methylene-blue nerve demonstration of Jaques. This had discouraged trials of instillation anæsthesia.

Refrigerants have the disadvantages of superficiality and broadness of action, pain of freezing and of thawing, and devitalization. Cauterants are also inefficient. Fluids (aniline oil and alcohol) containing cocaine, which cause endosmosis, dehydration, and molecular separation of the derm, are the best instillation anæsthetics, barring the toxicity of the oil.

The embryological formation of the mucous layer of the drum membrane by the Eustachian tube and the identity of the nerve supply of drum and tube led author to test desensitization of the drum membrane by tubal anæsthetization.

Conclusions are:

1st. That the skin has very little to do with the exquisite pain of palpation.

2d. Pain of palpation does not depend on impact irritation but on excitation of sensory apparatus of drum cavity.

3d. Drum knives are generally inefficient. Incision should be made with little pressure and with knife like Graefe. Pain of paracentesis is caused largely by the pressure.

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[1] A very instructive paper "On the Disturbances of Musical Audition," by Dr. Ferd. Alt, of Vienna, appeared in the *Monatsschrift für Ohrenheilkunde*, June, 1902.

4th. Isotonic or iso-osmotic solutions of cocaine should be used to avoid œdematization of the tube.

Supplementary report on a case of double stapedectomy operated upon ten years ago. By Dr. FREDERICK L. JACK, Boston, Mass.

The case is one of a number reported at the meeting of this Society, July 20, 1892. It is an interesting one not only on account of the effect of the operation on the hearing, but because it is probably the only instance of a person without a stapes in either ear.

The patient is a girl twenty years old. The impairment of hearing was the result of a chronic non-suppurative inflammation in both middle ears. The left was the worse and the first one operated upon. The improvement in the hearing was so great that two months later, at her request, the right stapes was also removed.

At the time of my original report it was suggested that probably time would diminish the improvement in hearing if it did not destroy it altogether. On the contrary, ten years have elapsed without apparent diminution.

During this time the case has been under observation, and was last seen in May, 1902. General conversation (also hearing for all ordinary sounds) has been good, whereas previous to the operation it had been bad. The drumheads have remained healed. The portion covering the seat of operation is somewhat sunken, forming a movable membrane over the oval window. There are no signs of increased changes in the middle ear. This case in the light of our present knowledge is unique.

I take this opportunity to state conclusions based on the past ten years of investigation.

1. Removal of the stapes does not destroy hearing, but sometimes improves it. The contrary statements found in most textbooks up to the time of my paper were incorrect.

2. The operation upon the profoundly deaf is not advisable. This opinion is based upon seventy cases. In this class of cases, as a rule, the bone cannot be removed, and if it were the chances are that no improvement will follow as the sound-perceiving apparatus has undergone irremediable changes.

3. Removal of the stapes is a perfectly justifiable procedure in certain cases of distressing vertigo (Ménière's disease) after all other means have failed.

4. Operation upon cases of moderate deafness may give brilliant results, but is attended with some risk to the hearing.

Remarks on **thrombosis of the sigmoid sinus,** with three new cases. By Dr. E. GRUENING, of New York.

Trautmann pointed out the anatomical peculiarities of certain temporal bones which he called dangerous ones. In these bones the sigmoid sinus runs far forward, curves inward, and passes over a projecting ledge which forms the posterior boundary of the jugular foramen. The jugular bulb rises against the floor of the tympanic cavity and lies on a higher plane than the lowest point of the sigmoid sinus. The plate of bone forming the floor of the tympanic cavity is very thin, and at times even dehiscent.

These temporal bones are considered dangerous because a purulent inflammation of the middle ear may by contiguity cause thrombosis of the jugular bulb with all the symptoms of sinus thrombosis. A case of this nature came recently under the observation of the writer.

CASE 1. — During an attack of scarlet fever the right ear of a child, three years of age, became affected. The temperature rose to 105°; the tympanic membrane bulged and was incised. The discharge continued, fever remained high, and the mastoid became tender. It was opened and cleared of pus. The sigmoid sinus encroached upon the mastoid and lay so far forward that its anterior wall almost touched the posterior bony wall of the external auditory canal. The exposed wall of the sinus looked healthy. The temperature, which remained high after the operation upon the mastoid, had all the characteristics of the temperature of sinus thrombosis. The sinus was incised; it contained liquid blood. The bulb was exposed and found thrombotic. The jugular vein had become changed into a solid cord intimately adherent to the pneumogastric nerve. The jugular vein was resected and the thrombus of the bulb removed. The improvement in the condition of the child was immediate.

CASE 2. — A girl, fourteen years of age, had an attack of measles. She was recovering when, on the tenth day, her right ear began to pain. Incision of the drumhead without relief. The patient was dizzy, vomited, had pronounced photophobia, rotary nystagmus, and tender mastoid. Temperature 104°, pulse 110. Mastoid opened. It was a large mastoid of the pneumatic variety. All the cells were filled with sero-purulent material. Sinus was exposed and looked healthy. Temperature rose to 106°; patient became delirious. I made an incision through the sinus wall and evacuated a large quantity of clear serum. The serum flowed at least ten seconds. From the central end of the sinus a large clot was removed, and the sinus bled freely from above; no hemorrhage from below. The internal jugular was exposed. It was found full of fluid blood; the vein was resected. The patient did not recover consciousness, and died the following day.

The evacuation of a large quantity of serum from an infected sinus was to me a new feature.

CASE 3. — A boy, eight years of age, was admitted to the Mt. Sinai Hospital. Right mastoid tender; no discharge from middle ear. Drumhead had been incised at the dispensary; temperature 105°. No history of middle-ear trouble could be obtained. The boy was observed in the hospital four days. At night the temperature would fall to 100° and rise in the morning to 104°. On the fifth day he had a chill with a temperature of 105° and a tender right mastoid. In the operation upon the mastoid the inner table was found to be necrotic in the region of the sigmoid sinus, but the sinus itself could not be found. The operation was extended to the region of the lateral sinus above and to the jugular bulb below, and clots were found and removed from both regions. The sigmoid sinus had shrunk so much that it could not be recognized. The patient had a chill and temperature 106° the night following the operation. The internal jugular vein was then exposed and resected. It was filled with fluid blood. The patient recovered.

REPORT OF THE ELEVENTH MEETING OF THE GERMAN OTOLOGICAL SOCIETY IN TRIER, MAY 16 AND 17, 1902.

By Dr. ARTHUR HARTMANN.

Translated by Dr. ARNOLD KNAPP.

The meeting began with an introductory address by the President, Prof. SIEBENMANN, in which he spoke of the loss that the Society had sustained during the past year by the death of Prof. Steinbruegge, Prof. Trautmann, Prof. Fick, Prof. Goltz, and Prof. Secretan.

A joint report on the treatment of **acute purulent otitis** was presented by BEZOLD, Munich, and KOERNER, Rostock. Bezold's paper will be published in full in these ARCHIVES.

KOERNER mentioned first the objection which Zaufal had raised against paracentesis of the drum membrane. He was very much opposed to this objection, both on theoretical as well as on clinical grounds. The decision in these therapeutic questions rests entirely upon clinical experience and not upon the ever-changing theoretical ideas. Clinical experience stands for early paracentesis. The speaker describes the usual method of treatment of acute purulent otitis as practised at his clinic, which does not follow a strictly schematic course, but is based upon the following principles: Paracentesis is used as soon as an exudate is recognizable in the tympanum. When the symptom-triad—bulging of the drum, fever, and pain—appears, there is no excuse for neglecting paracentesis. After this the auditory canal is drained with a strip of gauze and an absorbing bandage is applied. The attempt to disinfect the auditory canal before paracentesis is quite useless. The aseptic dressing protects against a secondary infection. Rest in bed is essential. The diseased tympanum must be kept at rest, and no inflation should be practised. It is especially important to see that the discharge of pus can freely flow through the paracentesis wound. Irrigating the canal is usually necessary in cases of tenacious muco-purulent discharge. Applications to the external surface of the mastoid (leeches, iodine) are of no use —may even produce dermatitis masking a complicating mastoiditis. Ice is applied when the mastoid is swollen and very painful, but only in the most severe cases, as the application of ice prevents the application of a bandage.

Of 78 cases treated, only one, complicated by stenosis of the canal, became chronic. The others were all cured with closure of the wound in the drum and complete restoration of hearing. The recovery took place the more rapidly the earlier the paracentesis was made. On an average recovery took place:

on the 7th day where the paracentesis was made on the 1st.
" " 9th " " " " " " " " 2d.
" " 14th " " " " " " " " 3d.
" " 15th " " " " " " " " 4th.
" " 16th " " " " " " " " 5th.
" " 24th " " " " " " " " 6th.
" " 26th " " " " " " " " 7th.

The recovery in 42 cases took place very much later where the primary paracentesis could not be performed, as the patient did not begin treatment until after the spontaneous rupture had taken place. In these cases the early spontaneous rupture seemed to be conducive to more rapid healing than in those where it occurred late. On an average recovery took place:

on the 14th day where the spontaneous rupture took place on the 1st.
" " 17th " " " " " " " " 2d.
" " 26th " " " " " " " " 3d.
" " 21st " " " " " " " " 4th.

The following facts show that early paracentesis is the best guard against mastoiditis. Among 90 cases of mastoiditis which were operated on at about the same time, paracentesis was done in 19, and in 4 of these it was done at the proper time—namely, the first or second day. In an uninterrupted series of 405 acute and chronic mastoiditides which were operated on, paracentesis had been done in only 43. During this same interval more than 1200 paracenteses had been performed in the clinic. If the paracentesis were an unfavorable procedure, more cases of mastoiditis would be observed where previously paracentesis had been done.

Dr. Piffl replied and described the method of treatment followed in Zaufal's clinic in Prague. In their minds the genuine acute otitis media in otherwise healthy persons is a disease which runs a cyclical course and in general progresses more rapidly and more favorably if no perforation of the drum supervenes. Treatment is directed towards relieving the pain and retarding the spontaneous perforation. Hot applications of acetate of aluminum are made, salicylic acid is administered, iodine applied locally, and cocaine instilled. If the general focus is situated in the mastoid cells, they of course must be laid open.

Dr. Delsaux (Brussels) said that at the last meeting of the French Society of Laryngology, Otology, and Rhinology, the same subject had been discussed; the general consensus of opinion was in favor of early paracentesis without inflation or irrigations. If the purulent discharge lasts more than two or three weeks, combined with mastoid symptoms, the mastoid operation is undertaken. It was decided to elect a committee which was to hand in a report in two years.

The subsequent discussion proved that the opinions are still very diversified.

Dr. Vohsen (Frankfurt) recommends that the patient should always lie on the healthy side, and in case of both ears being affected the position should be changed. Dr. Leutert (Giessen) cannot understand the value of daily regular irrigations, dipping out, and the insufflation of boric acid. Dr. Kretschmann (Magdeburg) thinks that the paracentesis should not be done on the first or second day, but that it is better to wait. He is opposed to the treatment with boric acid. Dr. Ostmann (Marburg) has had the same experience as Koerner. He is in favor of packing the canal and the aseptic dressing and is opposed to boric acid and the air douche. Dr. Passow (Heidelberg) makes an early extensive paracentesis measuring 8 to 9 *mm*. Dr. Brieger (Breslau) has seen unfavorable results from the application of leeches at the tragus. The value of cold he regards as overestimated. All irrigations are questionable on account of the danger of infection. Catheter may be used without fear. Dr. Kümmel (Breslau) emphasizes the various varieties of the disease. The inflammation of the mastoid cells is not a consequence of the otitis, but a complicating disease. Dr. Jansen (Berlin) recommends early paracentesis and regards the insufflation in the canal as out of date. Dr. Jens (Hannover) employs carbol-glycerin before paracentesis. Dr. Siebenmann (Basel) thinks that there are cases where the paracentesis had better not be done. It should, however, be especially employed in children in the first years. The treatment with boric acid has never had unfavorable consequences. Dr. Eschweiler (Bonn) has had personal and favorable experience with the continuous application of the ice-bag.

Dr. Röpke (Solingen) read a report on **accidents of the ear** and **the relative estimate of loss in earning ability in the sense of the accident-insurance law.**

Dr. Killian (Freiburg), **my method of radical operation for chronic empyema of the frontal sinus.** In frontal sinuses of complicated form, the author resects the anterior and lower walls of the frontal sinus, with complete removal of the mucous membrane, and the upper orbital margin remains as a narrow bony ridge for cosmetic purposes. The ethmoidal cells must be completely eradicated to accomplish this, and a broad passage made between the frontal sinus and the nasal cavities. This is most readily accomplished by resecting the frontal process of the superior maxilla, and this defect is brought into communication with the aperture left after removing the lower frontal sinus wall. The cutaneous incision passes below the eyebrow to the middle of the naso-labial fold.

Dr. Killian demonstrated a model of the nose in which the relations of the accessory sinuses were very well shown.

Dr. Streit (Königsberg) described a **method of exploring the anterior surface of the petrous pyramid in search for deep-seated morbid processes of the petrous bone,** with demonstration of specimens. To gain access to the anterior surface of the pyramid, the upper canal wall, the root of the zygoma, and the transition from the upper to the anterior canal wall must all be removed. The dura is exposed and retracted up to the apex of the pyramid with a specially constructed spatula.

Dr. Ostmann (Marburg) gave the **results of the hearing examination in 9 cases of acute perforative middle-ear inflammation.** Each case was examined daily with the continuous-tone series with a view to determine: (1) the range; (2) variations within the hearing limits; (3) Weber's, (4) Rinne's experiments. The results were elucidated by curves on plates. These will shortly be published in full.

Dr. SCHEIBE: In the course of acute middle-ear suppuration, where there is sudden loss of the high tones and a decided diminution of the hearing for whisper, a perforation into the inner ear is to be suspected and operation is required.

Dr. KÜMMEL (Breslau) reported on attempts with **telephonic examination of the hearing.**

Dr. ESCHWEILER (Bonn), **on nystagmus in one-sided defects of the labyrinth.** A sequestrum was removed from a patient twenty-two years of age which presented the cochlea and vestibule and parts of the semicircular canals. On examining this patient for nystagmus the result differed from Wanner's three cases; nystagmus occurred on looking to the left when the patient was rotated from the left (healthy side) to the right (diseased side.) He does not think that the explanation was so easily explained by the function of the semicircular canals as it seems from Wanner's statement, and that we should above all determine whether the nystagmus is caused by a deviation of the eyeballs.

Demonstration of the embryology of the muscles of the middle ear. Serial sections from the heads of pig embryos 10.5 to 53 *mm* long were exhibited. The tensor tympani muscle, according to the author, is derived from the masticating muscles. The intervening part is the tensor of the soft palate.

Dr. SIEBENMANN (Basel) showed, with microscopic specimens and drawings, the **pathological conditions found in the labyrinth of a congenital deaf-mute.** In this case the membranous cochlear canal was dilated, with the formation of folds in the external wall and around the round sacculus; there was degeneration of the neuro-epithelium of this part of the labyrinth, and insufficient development of the cochlear ganglion and its peripheric nerve termination. The bony labyrinth, on the other hand, was quite normal. From the autopsy findings this excessive formation of folds on the embryonal labyrinth walls plays a much greater rôle in the pathogenesis of congenital deafness than has been assumed.

Dr. RUDLOFF (Wiesbaden) showed microscopic specimens of **changes in the cartilages of the Eustachian tube in hyperplasia of the pharyngeal tonsil,** the presence of fibres in the basement substance, and degenerative changes in the shape of the cartilage cells.

Dr. BRIEGER (Breslau) on **otitic serous meningitis.** The occurrence of a purely otitic meningitis has not been shown anatomically. It can only be diagnosticated when the signs of increased intracranial pressure preponderate in the course of the disease, and these symptoms disappear when the intracranial pressure is reduced. Cases of this kind have been described where among other symptoms local paralysis and in one case a nuclear ocular paralysis disappeared after lumbar puncture. The increased pressure must be shown in an attempt to remove the pressure, *i. e.*, by lumbar puncture. The quantity of cerebro-spinal fluid appears to be increased by suppuration in the labyrinth. Serous otitic meningitis is not an idiopathic process, but is generally a symptom of suppuration in the labyrinth. The entire cerebro-spinal system is equally affected by the increased fluid. Therapeutically lumbar puncture should first be attempted to relieve the pressure. The most important factor is to exclude the primary focus.

Dr. Bloch (Freiburg), **What do we call a high palate?** The speaker has been in the habit of first estimating the dimensions of the palate in the 600 cases which he has examined by his eye and designating them as high, medium, etc., and then has found the index by measurements. The palate recorded as high shows an index of 58. In 286 cases of adults with nasal expiration the palate index was 52.5, while in 199 adult mouth-breathers the palate index averaged 63.8.

Dr. Jansen (Berlin) reported on his latest **experiences with chronic suppuration of the accessory cavities.** Jansen has modified his method of operating. The anterior wall of the frontal sinus is divided at its medial and lateral extremities with a burr from the side of the frontal sinus. The frontal wall is then grasped with a heavy bone forceps and broken off. The overhanging bone margins are removed. The loosened bone and periosteal flap can then be applied against the posterior wall of the frontal sinus and the sinking in of the forehead is avoided.

The operation for empyema of the antrum of Highmore has also been modified. If the mucous membrane seems capable of returning to the normal condition it is left in place as much as possible. A broad permanent communication into the nose is made and the operative wound in the canine fossa is closed with a suture. The ethmoidal cells and occasionally the sphenoidal sinus are freely exposed from the antrum.

Dr. Kretschmann (Magdeburg) demonstrated a handle for the electro-motor.

Dr. RUDLOFF (Wiesbaden) exhibited an aseptic pocket-case for the aurist and a retractor for the lips.

Dr. KOERNER was elected President for the following year. It was decided that the next meeting was to take place in June, 1903, in Wiesbaden.

Dr. DENKER will present a report on **ankylosis of the stapes.**

REPORT ON THE PROGRESS OF OTOLOGY DURING THE FIRST QUARTER OF THE YEAR 1902.

BY DR. A. HARTMANN, BERLIN.

Translated by Dr. ARNOLD KNAPP.

ANATOMY.

1. **Hammer, J. A.** On the development of the middle-ear cavity and the external auditory canal. *Archiv für mikroskopische Anatomie und Entwicklungsgesch.*, vol. lix., pp. 471–628.

2. **Rickenbacher.** Investigations on the embryonal membrana tectoria of the guinea-pig. Dissertation. *Anatomische Hefte*, vol. xvi., No. 2, Part 1.

3. **Alexander.** On atypical tissue-formation in the membranous labyrinth. *Arch. f. Ohrenheilk.*, vol. lv., p. 54.

1. This paper is probably the most complete that has appeared on the subject, and is especially noticeable because Born's modelling method has been made use of to reconstruct the fœtal middle-ear. The material used consisted of twenty-seven human fœtuses varying from 3 *mm* in length to maturity.

ESCHWEILER.

2. The author has examined the construction of the membrane of Corti in seven periods of development of the guinea-pig, and has gone over the work of Zinner and Hammerschlag. He comes to a different conclusion, namely, that the membrane is an exudative product of the epithelium in the ductus cochlearis and consists of two parts—one cuticular on the large, and another cuticular on the small epithelial ridges. Both are connected with the cellular heads in the beginning. In a further differentiation, the large epithelial ridge returns to the form of the epithelium of the spiral sulcus, and the small epithelial ridge develops into Corti's organ, and the connection of the covering membrane with the

cellular bodies becomes lost. The outer portion of the membrane retains the fibrous connection with the heads of the hair cells for some time. In the appendix there is a description of the pathological changes found in the cochlear canal (resembling those found by Scheibe in deaf-mutes) by Alexander in an incompletely albinotic white cat. ESCHWEILER.

3. ALEXANDER found in vertebrates and in man circumscribed nests of epithelial cells between the epithelium and the sub-epithelial stratum of the mucous membrane of the labyrinthine wall. In the ductus endolymphaticus circumscribed clusters of epithelium were found which extended into the endolymphatic spaces. In the wall of the ampulla of the posterior semicircular canal of the guinea-pig embryo a cyst-like cavity was found in the epithelium. In the nerve terminals defects in the neuro-epithelium were met with. In two cases epithelial cells were found in the neuro-epithelium. As these atypical forms were found in embryos their embryonal origin seems assured, and they are the result of an atypical growth rather than a pathological formation. DENKER.

PHYSIOLOGY.

4. **Lucae.** Two physiological acoustic lectures. *Arch. f. Ohrenheilk.*, vol. liv., p. 268.

5. **Eschweiler.** On Zimmermann's theory of the mechanism of hearing and its disturbances. *Arch. f. Ohrenheilk.*, vol. lv., p. 59.

6. **Ostmann.** On the association of the facial nerve during listening. *Arch. f. Ohrenheilk.*, vol. liv., p. 209.

4. I. On the function of the round window.

(1) A hitherto unknown mode of action of the so-called artificial drum.

The author endeavors to explain in the following manner the fact that a pledget of cotton placed on the promontory, and which does not cover the window, frequently produces a marked increase in hearing. The acoustic waves which pass to the cochlea both through the promontory and the windows produce an interference of the auditory waves and a consequent diminution of the perception of sound. Placing the cotton pledget on the promontory causes the labyrinth wall to no longer act as a sound conveyer, and the interference then ceases and improved hearing results. In regard to Zimmermann's view, that the round window only serves for localization of the vibrations which pass to the inner ear through the labyrinth capsule, the author states that the pressure in the cavity is the same for all directions, and that consequently auditory waves must also influence the membrane of the round window.

(2) On the successful operation on the round window.

Two exostoses situated at the entrance of the round window were removed by the electro-motor burr, and very marked improvement of hearing with permanent cessation of loud subjective noises resulted.

II. Observations on the auditory vibrations of the drum membrane in the living ear.

With the aid of his otostroboscope, Lucae has been able to examine the vibrations of the drum after the action of sound. The sources of the sound were two pipes tuned to *c*, equalling 128 v. d. On blowing into the pipe a coarse movement of the postero-superior quadrant of the drum just back of the malleus was noticed, while the rest of the drum remained at rest. On the sounding of deeper notes the rest of the drum joins in the vibrations. Denker.

5. The author, with others, is opposed to the opinion of Zimmermann, namely, that the promontory is of special importance for the perception of sound, because comparative anatomy shows that in animals with excellent hearing the promontory is not always directly opposite the drum membrane. Zimmermann's view, that the vibrations of the basilar nerves are only possible when the movable cochlear window permits the escape of the labyrinth water, is in direct contradiction to this same author's opinion that the auditory waves are transmitted to the basilar fibres at their place of attachment. According to Zimmermann, the membrane of the cochlear window must have two functions. First, it must respond by relaxation to the minutest movements in the labyrinth water, and should thereby permit the gradation of the entire labyrinth pressure as it offers an elastic resistance to the labyrinth water which is pressed inward by the stapes. The author with perfect justice claims that these two functions cannot be performed by the same membrane. In conclusion it is stated that Zimmermann's theory has not been able to elucidate the difficult parts in the interpretation of auditory perception which have not been solved by the Helmholtz theory, and that the former is not an advance in our knowledge of the auditory function.

Denker.

6. Ostmann has endeavored to fix the changes in the facial

muscles occurring during listening by means of photographs. In some of the persons examined the eyes would sometimes be turned to the side of the listening ear, sometimes they would be allowed to droop, and occasionally were turned to the opposite side. The lips of some were tightly pressed together, and in others a previously closed mouth would be slightly opened. In some a distinct contraction of the mouth to the listening side took place, and in one case reported convulsions occurred of the facial muscles on the listening side. DENKER.

GENERAL.

a.—REPORTS AND GENERAL COMMUNICATIONS.

7. **Grunert** and **Schulze.** Report of the Royal Ear Clinic in Halle from April 1, 1900, to March 31, 1901. *Arch. f. Ohrenheilk.*, vol. liv., p. 63.

8. **Haug** and **Laubinger.** Report of the Royal Polyclinic for Ear Diseases in Munich for the year 1900. *Arch. f. Ohrenheilk.*, vol. lv., p. 67.

9. **Ostmann.** Diseases of the ear among school children in the county of Marburg. *Arch. f. Ohrenheilk.*, vol. lv., p. 72.

10. **Koerner.** I. The changes in the optic disc in otitic disease of the brain, meninges, and sinuses. *Deutsch. Arch. f. klin. Medicin*, vol. lxxiii.

11. **Burger.** Diseases of the ear and life insurance. *Klin. Vorträge*, Haug, vol. iv.

12. **Schwartze.** Statistical report on the number of patients and students in the University Ear Clinic in Halle from April 1, 1884, to April 1, 1901. *Arch. f. Ohrenheilk.*, vol. liv., p. 127.

7. Of the 2425 patients treated in this ear clinic, 247 were admitted to the hospital. The simple mastoid operation was performed in 35, and complete mastoid operation in 94 cases. The ossiculectomies numbered 28. In this operation, Zeroni's incus-hook proved practicable. Owing to the large number of ossiculectomies, the number of mastoid operations is proportionately diminished. Three noteworthy cases are reported. In the first, the complete operation was made necessary after attempts at extraction of a foreign body. Recovery took place with reduced hearing. The second case was one of otitic pyæmia, cured by sinus operation and jugular ligation. In the third patient, a cerebellar abscess was healed by trephining. In this case, lumbar puncture evacuated a distinctly cloudy fluid under high pressure. As there were no increase in leucocytes and no bacteria, a diagnosis of cerebellar abscess, and not meningitis, was made. The almost continuous vomiting which followed the cerebral hernia was successfully treated by systematic lavage with physiological salt solution.

Of the twelve cases which terminated fatally three succumbed to tuberculous meningitis, two to cerebral and spinal meningitis; in one the meningitis, originating in the labyrinth, was associated with sinus thrombosis and cerebellar abscess. In another case, where, in addition to the extradural abscess, a sinus thrombosis was present, death resulted from cranial pressure, produced by a cerebellar abscess. The fatal termination in one case was produced by meningitis of the ventricles secondary to a cerebellar abscess. One patient died from a second latent abscess in the parietal lobe, while the cause of death in another was septic endocarditis and general septico-pyæmia. Purulent thrombosis of the sinus terminated fatally in two cases. It would lead us too far to report all the many interesting individual points in these cases.

DENKER.

8. Of 2831 patients, 28 were operated on for simple mastoiditis, and 16 for chronic trouble. The most frequent operation was paracentesis, which was performed 57 times. Adenoid vegetations were removed in 128 cases. Of 53 foreign bodies, 2 required anæsthesia for their extraction. DENKER.

9. The author has performed the exceedingly tedious task of examining the ears of 7537 school children. This required the daily examination of the ears of forty to fifty children for a period of six months. The hearing was tested by whispering the numerals from 1–100, and the deaf children who were unable to hear this whisper at 8 *m* with one or both ears were divided into two groups, of which one heard the whisper from 0–4 *m*, and the other from 4–8 *m*. Of these children, 28.4% were more or less deaf. The percentage of deaf children in the various localities varied between 6.5% and 55.2%. The author concludes that most ear trouble is found in those localities where not only the climate but the frequency of infectious diseases and other causes are favorable to its development, and where the means for cure are most unfavorable on account of local and social conditions. The boys were not only more frequently, but also more severely affected than the girls. Finally, the changes found in the drum and canal are given. In 607 cases, scars and circumscribed atrophies of the drum were found, with or without calcareous deposits or retraction; dry perforations existed in 0.7%; chronic suppuration in 0.9%, and acute inflammation in 0.4%. DENKER.

10. I. Changes in the disc can be absent in all intracranial complications of suppuration of the ear and of the temporal bone.

They occur more frequently in combinations of the various kinds than any one intracranial inflammation alone. From the changes in the disc (neuritis or choked disc) no deductions can be made as to the kind of intracranial lesion. The fact that the optic-disc change is more marked on one side does not necessarily prove one-sided disease or a more marked presence of the disease on that side. Changes in the optic nerve should not necessarily have much influence in making a prognosis ; even the increase of the neuritis or of choked disc after removal of a suppuration from the cranial cavity is not of itself unfavorable.

II. On acute inflammations of the ear and temporal bone in diabetics.

This will be reviewed in another place.

KOERNER.

11. The following conclusions are offered: Chronic suppurative otitis media should not necessarily reject the candidate when the following conditions are absent: (a) Inflammation of the attic or mastoid process ; (b) tuberculosis or cholesteatoma ; (c) an affection of the bone ; (d) seventh-nerve paralysis ; (e) vertigo or monolateral headache, with a free discharge of pus not hindered by a stenosed canal. Patients who recovered after having been operated on, can be accepted with increased premiums.

BRUEHL.

12. In this interval of seventeen years, 2835 patients were treated in the in-door department. Of these, 165 (5-6 %) died; 29,460 patients were treated in the out-door department. Since 1863, 35,423 patients have been treated in the polyclinic. The largest number of patients treated in the hospital for any year was 234. Death was usually the result of meningitis or sinus phlebitis. In 30 cases the fatal cause was uncomplicated meningitis; in 40, meningitis complicated with brain abscess, sinus phlebitis, and subdural abscess; an uncomplicated sinus phlebitis with pyæmia was fatal in 28; sinus phlebitis complicated with brain abscess was fatal in 12. The number of students that have taken the course was 1527. Forty-five otological inaugural dissertations were published. In addition to the 1527 students, 121 physicians took the course, and there were 100 additional who took part in an advanced course for practitioners.

The report closes with an index of all the scientific papers that have been published in the Clinic since April, 1884.

DENKER.

b.—GENERAL SYMPTOMATOLOGY AND PATHOLOGY.

13. **Berthold.** On monaural diplacusis. *Arch. f. Ohrenheilk.*, vol. lv., p. 17.

14. **Eitelberg.** Otalgia and mastalgia in neurasthenia and hysteria. *Wiener med. Blätter*, No. 50, 1901.

15. **Roechling.** The irritability of neurasthenics for auditory impressions, with practical deductions for health resorts. *Deutsche med. Zeitung*, No. 45, 1902.

16. **Ostmann.** On the predisposition to ear diseases in children produced by tuberculosis in the next of kin. *Arch. f. Ohrenheilk.*, vol. lv., p. 72.

17. **Hammerschlag.** On the pathology of the ossicular chain. *Arch. f. Ohrenheilk.*, vol. lv., p. 83.

13. BERTHOLD reported a case of diplacusis monauralis in a musician with an unusually finely developed musical hearing, and concludes that diplacusis is an affection of the labyrinth, as is now generally accepted. According to the most recent microscopical investigations of the histological contents of the labyrinth, it can be assumed that the same nerve fibre may be excited by tones of varying pitch as the nerve fibre which responds to the peripheral prolongation of the bipolar cochlear cell is in communication with many hair cells. DENKER.

14. An eight-year-old neurasthenic suffered from pain in the mastoid process after influenza, which was cured by general treatment. A neurasthenic, fifty-one years of age, experienced severe pain in the ear on swallowing and after syringing out the ear. These symptoms were relieved after the use of electricity.

BRUEHL.

15. Auditory impressions are as important for the onset and for the continuance of the neurasthenia of large cities as is active mental work. The mood is influenced more by auditory impressions than by those of the other senses, and hence ability to work and sleep is often interfered with. In the treatment, naturally the avoidance of auditory sensations should be borne in mind, hence in baths a properly located dwelling and complete rest should be assured. BRUEHL.

16. The author has been impressed with the probable relation which exists between tuberculosis and deafness and has examined a number of deaf children in this regard, with the result that the greater number of deaf children have been found to be the offsprings of tuberculous parents. It seems probable that the tuberculous tendency aids the onset of ear disease and furnishes an unfavorable influence for its cure. The author thinks the con-

necting link between tuberculosis of the parents and ear disease in the child is furnished by the increased irritability of the mucous membrane of the upper respiratory tract. DENKER.

17. (1) Synostosis of the malleo-incudal articulation.

Instead of a joint between these two bones a bony bridge was found in one place which was unevenly broad and in places showed distinct Haversian canals. The tympanum was free from inflammatory products, hence it is likely that this was a case of isolated disease of the joint.

(2) Anomaly in formation of the stapes.

The two arms of the stapes formed a single thick bony band, which next to the stapes plate became divided into two arms connected by a thin plate of bone. The stapes plate and the oval window were reduced to one third of their normal size. This anomaly was found in a degenerate individual. The author thinks that as in these individuals disturbances of hearing are often present, disturbances in development of the sound-transmitting apparatus may be assumed to be present. DENKER.

c.—METHODS OF EXAMINATION AND TREATMENT.

18. **Bing, Albert.** On the transmission of sound and its relation to the testing of the ear with the watch and tuning-fork. *Monatsschr. f. Ohrenheilk.*, No. 5, 1902.

19. **Gradenigo.** On the result of operations in the tympanum for acoustic purposes. *Arch. f. Ohrenheilk.*, vol. liv., p. 1.

20. **Gradenigo.** On exenteration of the tympanic cavity for acoustic purposes. *Arch. f. Ohrenheilk.*, vol. liv., p. 249, and vol. lv., p. 1.

21. **Bukofzer.** On adrenalin. *Allgemeine medicin. Centralztg.*, No. 44, 1902.

22. **Arnheim.** Solutions of lysoform to prevent clouding of the laryngeal mirror. *Allgemeine medicin. Centralztg.*, No. 47, 1901.

18. In regard to bone-conduction, BING is of the opinion that the vibration of any source of sound which is brought in contact with the bone is transmitted directly through the bone to the labyrinth without affecting the tympanic cavity, which is, of course, opposed to Bezold's idea that excitation of the end apparatus of the auditory nerve can take place only through the sound-conducting apparatus. Against this latter theory the author speaks of the impossibility of vibration in the transmitting apparatus in cases of anchylosed stapes-plate. The various results of hearing tests, especially those of Weber and Rinne, which cannot be sufficiently explained by the osteo-tympanic

conduction, can be explained by the aid of the direct molecular osseous transmission of sound to the labyrinth. PIFFL.

19. In cases where functional integrity of the internal ear seems assured, **GRADENIGO** recommends either removal of the drum, hammer, and incus, and, if possible, also the stapes, or removal of the incus. At the present time the author cannot state which of the two methods is better. Regarding the post-operative treatment, it is important to watch the regeneration of the drum, and to prevent its adhesion to the promontory.

DENKER.

20. **GRADENIGO** describes three varieties of cases in regard to the prognosis of operations on the tympanum for acoustic purposes. The most favorable prognostically are disturbances of hearing following middle-ear suppuration, while dry formations and progressive deafness (Scheibe's) are the most unfavorable. In the third variety, Gradenigo places those changes after a purulent otitis which do not leave any distinctly recognizable residua and no special change in the drum, but where the history points unmistakably to a former ear trouble. After thorough disinfection of the auditory canal, which must precede the operation by several days to avoid hyperæmia, the operation is undertaken in the following manner: 1. Division of the drum membrane along its periphery, leaving a small part in the neighborhood of the neck of the hammer, to avoid copious hemorrhage. 2. Tenotomy. 3. Division of the malleo-incudal joint. 4. Complete division of the drum, loosening of the hammer with a hooked probe, and extraction of the same with suitable forceps. (The reviewer recommends for this last step the use of Wilde's snare.) 5. Removal of the anvil with a forceps or with Zeroni's incus hook. 6. Extraction of the stapes. The results of this procedure are not gratifying. In the after-treatment the author lays great stress on a careful aseptic procedure free from all irritation. Three cases of chronic catarrhal middle-ear disease, and two cases of oto-sclerosis and chronic catarrhal otitis secondary to purulent middle-ear disease, purulent otitis with perforation of the drum and its sequelæ, are reported, which have been treated by operative removal of the drum, hammer, and incus. In three out of nine operative cases the onset of purulent disease could not be avoided.

As regards the effects of the operation, Gradenigo concludes as follows: 1. The result of the operation is better in proportion to the integrity of the internal ear. 2. The most favorable results are met with in the sequelæ of purulent middle-ear disease, with partial destruction of the drum and ossicles. Good results may be obtained in cases of old purulent disease without any characteristic changes of the drum or of the ossicles, and where the diagnosis can only be assumed from the history. 3. The unusual phenomenon that the results of the operation have been better in sclerosis than in chronic catarrhal forms of the disease is explained by the fact that the atrophic drum-membrane usually present in sclerosis prevents the formation of a cicatricial drum, and that the labyrinth wall is thereby more accessible to the sound waves. 4. A very important factor in the definite result is the after-treatment. 5. In diseases of the inner ear the operation has made the condition worse. 6. The experience derived from these operations shows that our present knowledge of the physiology and pathology of the ear is to a great extent still fragmentary and uncertain. DENKER.

21. The author thinks that adrenalin in 1:1000 solution causes contraction of the capillaries, but does not influence the size of the veins and arteries. There is no result in habitual hyperæmia of the mucous membrane, possibly because the capillaries have lost their contractility. Adrenalin is to be recommended to arrest capillary bleeding, to enlarge the nasal lumen, and to relieve hoarseness resulting from hyperæmia of the vocal cords. It is without unpleasant effects, and to a certain extent acts as an anæsthetic. BRUEHL.

22. A one to two per cent. solution of lysoform is recommended to prevent clouding of the laryngeal mirror.

BRUEHL.

d.—DEAFMUTISM.

23. **Rundström.** Investigations on deaf-mutes, and comparative examination of the hearing remnants of deaf-mutes and the deaf. *Nordisk medicinsk Arkiv*, 1901, Part I, vol. iii., No. 21.

23. The author has examined 139 inmates of a Swedish deaf-mute institution. The quantity of the hearing was tested, and also the quality, by means of tuning-forks, organ pipes, and Galton whistles. In 45.32 % the deafmutism was congenital, in 41 % acquired, in 13 % uncertain. Twenty-six of the inmates had one or more deaf-mute relatives. The most frequent cause of the acquired deafmutism was inflammation of the brain and scarlet

fever. In comparison with the examination of school children, it was proven that the deaf-mutes suffer from a much greater frequency of nasal and naso-pharyngeal affections; 180 ears were examined with a continuous-tone series. All weak-minded children were excluded. The ordinary classification of Bezold was adopted, and a seventh group of almost normal hearing was added. Acquired deafmutism in all groups was more frequent than the congenital. This was especially so in the cases of complete deafness (twenty-one), where the deafness was acquired in fifteen, and congenital in five cases. Again, in the seventh group, in nine cases the affection was congenital, and in only two was it acquired. In fourteen cases there was no hearing for vowels, though the hearing power in the central range was quite good. Bezold thinks that in these cases the trouble is localized in the brain. The author, however, supposes that it is the result of various concomitant external circumstances, which he endeavors to explain by the two following examples: A deaf-mute heard on examination vowels and words which were foreign to him, and because his hearing organ was unpractised he did not understand how to reproduce the sounds. Another deaf-mute whose hearing had recently become worse, but who previously had some learning as to how vowels and words sound, may, notwithstanding his diminished hearing power, grasp these sounds, and be able to reproduce them. The hearing power in the two cases is practically about the same.

It is not without interest to note how the hearing of persons who have become deaf in old age reacts to functional examination. The author has examined twenty-one of these cases. The hearing remnants were divided into the same groups as in the case of the deaf-mutes. They are often found smaller than in many deaf-mutes notwithstanding these people understand loud voice comparatively well because they have been able to hear and speak before becoming deaf. The author's conclusions are as follows: Examination of the hearing with the voice is insufficient to determine the amount of hearing. A complete functional examination should be obligatory in all deaf-mute institutions. It is of great importance to separate the relatively deaf-mute from the truly deaf-mute, and it is important that their hearing remnants be made use of so that they do not depend entirely upon their eyes in their intercourse with others. A thorough examination of all deaf-mutes is also of great importance because it will be possible to compare later the pathological findings with the clinical results. JÖRGEN MÖLLER.

EXTERNAL EAR.

24. **Belinski.** A case of congenital deformity of the right ear with atresia of the external canal. *Wratschebnaja Gaseta*, No. 1, 1902.

25. **Gauderer.** Operative cure of an almost complete atresia of the external auditory canal. *St. Petersburg. med. Wochenschr.*, No. 1, 1902.

26. **Haug.** On the use of local anæsthetic agents in operating on the drum and in the canal. *Arch. f. Ohrenheilk.*, vol. lv., p. 49.

27. **Herzfeld.** A new trephine to excise a portion of the drum membrane (myringectomy). *Monatsschr. f. Ohrenheilk.*, No. 6, 1901.

24. A newly-born girl presented the right auricle about one third the size of the left. The posterior half was attached to the anterior up to the external canal, which was marked by a barely perceptible depression. The latter was impassable to the finest probe. The lobule was very small; otherwise the ear seemed normal. The right auricle presented a transverse furrow at the junction of the upper and middle thirds. The child was in other respects normally developed, and the parents and other children have shown no abnormalities. SACHER.

25. A girl, eighteen years old, developed pain, tinnitus, and diminished hearing in the left ear at the end of the year 1899. There was no otorrhœa. The ear in June, 1900, showed on examination a very marked diminution of the lumen in the bony part of the external canal, permitting the passage of only a very fine probe. A hyperostosis starting from the posterior auditory canal wall extended internally to the annulus tympanicus. Whisper was heard in 25 *cm.* Suppuration and unpleasant odor have never been present. The patient suffered from headache, tinnitus, and transient pain, and as the condition of the middle ear was more or less unknown, it was decided to remove the exostosis by operation. This was done after retraction of the auricle, and the bone was removed in thin scales, whereby the drum was injured. The membranous canal was divided and tamponed against the walls of the newly-formed bony canal. A very obstinate otorrhœa set in. Hearing improved to whisper at 7–8 *m.* The headache disappeared, but tinnitus persisted. SACHER.

26. The author has tested the various preparations recommended to anæsthetize the drum, and has found that no one of them is completely reliable. He consequently practises para-

centesis without any local anæsthetic. When the tympanum was open, in addition to cocaine, acoin in 2 per cent. watery solution was also tried. In furuncles which had perforated spontaneously, HAUG recommends the use of orthoform. DENKER.

27. This instrument is modelled after the corneal trephine of Hippel. The removed portion of the drum is circular and remains attached to the trephine. The instrument is made by Windler, Berlin. PIFFL.

MIDDLE EAR.

a.—ACUTE OTITIS.

28. **Ephraim.** Acute middle-ear suppuration in a diabetic; fistula of the horizontal semicircular canal; periarticular abscess of the maxillary joint. *Arch. f. Ohrenheilk.*, vol. liv., p. 240.

29. **Falta.** A rare form of mastoid abscess with subsequent abscess of the parotid. *Monatsschr. f. Ohrenheilk.*, 1901, No. 6.

30. **Hammerschlag.** On acute disease of the mastoid process and its surgical treatment. *Wiener med. Wochenschr.*, 1902, Nos. 7–10.

31. **Heermann.** A case of hemorrhage from the carotid. *Arch. f. Ohrenheilk.*, vol. lv., p. 86.

28. Fistulæ of the semicircular canals are usually only encountered in chronic suppurations. In this case, however, there was a fistula as large as the head of a pin in the horizontal canal of a diabetic patient suffering from acute otitis. The pus in the periarticular abscess, according to the author, had made its way along the floor of the tympanic cavity or had broken through at the limit between the cartilaginous and bony Eustachian tube. DENKER.

29. A girl, twelve years old, developed a swelling at the posterior and upper wall of the canal, which contained a rather fetid collection of pus. On the sixth day an abscess of the parotid developed, accompanied by chills and fever. This was also incised. The mastoid process was curetted three times, and recovery took place in about three months. A second case was that of a woman twenty years old, who had had pain in the right ear with otorrhœa and facial paralysis five years previously. In the canal at the junction of the bony and cartilaginous parts and on the skin over the parotid gland there were numerous scars.

In the first case the possibility of mistaking the cause for a furuncle in the external canal seemed to be present, and the author discusses the differential diagnosis between furuncle and mastoid abscess. In this case the result of the hearing tests with a completely closed external canal seemed to point to the existing middle-ear affection. Finally the author declares himself in favor of conservative treatment and regards the radical operation as both dangerous and disfiguring, and considers that it is only indicated in prolonged fever, great pain, and brain symptoms. PIFFL.

30. Based upon experiences in Politzer's clinic, the author makes a plea for simple trephining of the mastoid process without opening the antrum. The accompanying case-histories of 58 female patients prove that the antrum in mastoiditis need not always be opened. It was only done in 25 out of the 58 cases. The question rests upon the contents found at operation. If the abscess is separated from the antrum by a bony wall apparently intact, the antrum is not opened. However, the antrum must always be opened if sudden pain sets in after cessation of the discharge. Recovery takes place quickly if the antrum remains unopened. BRUEHL.

31. Subacute, left-sided middle-ear suppuration after scarlet fever in a child three and a half years old. After syringing the ear canal very severe arterial hemorrhage occurred. The common carotid was ligated and the radical operation undertaken. A sequestrum with sharp edges was found on the floor of the tympanum which had probably broken from the wall of the carotid. After removal of the sequestrum the area was curetted until profuse hemorrhage took place; tamponing; recovery. After fourteen days, sudden unconsciousness, vomiting, and paralysis of the right extremities. Granulations in the floor of the tympanum were removed. Some fever for a few days, vomiting, and stupor, followed by death thirty-two days later. At autopsy a purulent thrombosis of the internal carotid was found extending to the circle of Willis. There were purulent deposits on the pia, pons, and cerebellum. The left ventricle was filled with greenish, discolored, fetid pus. An encapsulated abscess, as large as a walnut, was found in the corpus striatum. DENKER.

b.—CHRONIC PURULENT OTITIS.

32. **Müller.** Neurosis and operations on the mastoid process. *Arch. f. Ohrenheilk.*, vol. liv., p. 223.

33. **Jurgens.** Two cases of rupture of the internal carotid artery in diseases of the middle ear. *Wojenno medicinski Shurnal*, Dec., 1901.

34. **Ephraim.** On the mechanism of the growth of cholesteatoma. *Arch. f. Ohrenheilk.*, vol. liv., p. 244.

35. **Schwartze.** Historical notes on cholesteatoma of the temporal bone. *Arch. f. Ohrenheilk.*, vol. liv., p. 139.

32. In 10 cases of mastoid operations the middle-ear disease was complicated with epilepsy (2 cases), chorea, minor hystero-epilepsy and hysteria (4 cases), menstrual dementia, and multiple sclerosis of the brain and spinal column; the author observed one recovery, and in all the others a decided though transient improvement of the neurosis. The explanation, according to the author, is to be found in the action of anæsthesia and operative shock; also in hemorrhage and in the effects of the after-treatment. In all cases except one the cranial cavity was opened, consequently the dressing acted as a more or less permanent drainage of the cranial contents, and may in this way have had some influence on the nervous lesions localized in the cerebral cortex. The author recommends in cases of mastoid disease complicated with a neurosis an exposure of the cranial cavity.

DENKER.

33. Both patients were soldiers suffering from chronic purulent otitis. After the introduction into the ear of an uncertain irritating substance, exacerbation of the disease set in with rapid tissue necrosis. After several repeated and large hemorrhages from the ears, the patients succumbed. In both cases, at autopsies a circumscribed necrotic opening in the arterial wall of the carotid, as has been described in most cases was not found but a comparatively large destruction of the arterial vessel. SACHER.

34. In a case of cholesteatoma of the middle ear, which was treated by operation, the author found subsequently an enlargement of the operative cavity. To explain this, Siebenmann's view, that in youthful individuals the surrounding bone becomes pneumatic, and that the epithelium, to a certain extent, is drawn into the existing niches in a passive manner, is not sufficient, as in his case the patient was an adult with very sclerosed bone. He is more inclined to agree with Kirchner, and states that the cholesteatoma mass extends into the bony substance full of vessels and causes destruction of the bone. Repeated lamellar deposits occurred in this case, which may be regarded as a relapse, and were the cause of the enlargement of the wound cavity. DENKER.

35. The author states that unquestionably the first observations on cholesteatoma of the temporal bone on the living and on the dead were made by Virchow and described in his paper "Perlgeschwulst" in 1885. The works of von Tröltsch,

Habermann, and Buhl on the genesis of cholesteatoma are mentioned. The views of Forster, Volkmann, and Rindfleisch regarding cholesteatoma as a structure similar to epithelial carcinoma are reported. It seems strange that in this historical sketch no mention is made of the investigations of Bezold published in these ARCHIVES in 1889, and which is probably the most important publication on the etiology of cholesteatoma. DENKER.

c.—CEREBRAL COMPLICATIONS.

36. **Haug.** Erosion of the brain by cholesteatoma; perforation of the cholesteatomatous mass into the lateral ventricle. *Arch. f. Ohrenheilk.*, vol. lv., p. 26.

37. **Braunstein.** The importance of lumbar puncture in the diagnosis of intracranial otitic complications. *Arch. f. Ohrenheilk.*, vol. liv., p. 7.

38. **Stenger.** On thrombosis of the jugular bulb. *Arch. f. Ohrenheilk.*, vol. liv., p. 216.

39. **Zaufal.** In answer to Professor Grunert's paper; contribution to the operative treatment of otitic sinus thrombosis, especially the operative exposure of the jugular bulb. *Arch. f. Ohrenheilk.*, vol. lv., p. 30.

36. After exposing the antrum it was seen that an intensely fetid cheesy pus was present in all the surrounding bony spaces presenting the picture of fulminating osteo-myelitis. The cholesteatoma had, in addition to purulent sinus phlebitis, caused erosion of the brain, which in turn exposed the lateral ventricle.

DENKER.

37. In the Ear Clinic in Halle, lumbar puncture was performed since 1896 for diagnostic purposes on 48 patients 67 times. A canula 13 *cm* long and 1.3 *mm* thick was employed (the needle recommended by Quincke was not found satisfactory). The point of entrance was chosen between the fourth and fifth lumbar vertebræ at the lower part of the fourth. In adults it is better to enter about 0.5 *cm* to one side of the middle line, and in order that the needle should enter the dural sac in the middle line it is necessary to advance it forward and upward and toward the median line. The results of his experiences lead the author to conclude that lumbar puncture is an important diagnostic aid, and in order to estimate the value of the findings in the cerebrospinal fluid gained by puncture the following principles should be kept in mind: (1) An absolutely sure negative result—that is, normal fluid—excludes in an otitis with intracranial complication the presence of a diffuse purulent meningitis if the quantity of fluid is sufficient to have come from the cranial cavity. (2) A

positive result—that is, a morbid condition of the fluid under these circumstances—assures the existence of a diffuse purulent meningitis. (3) An opalescent clouding of the cerebro-spinal fluid makes the diagnosis of tuberculous meningitis very probable, even if on microscopic examination tubercle bacilli are not found in the fluid. DENKER.

38. The author has examined the relations of the sigmoid sinus to the extent, size, and position of the bulb and comes to the following results: (1) In some cases a true bulb is not formed and the sinus passes over into the jugular vein without any interruption. (2) Occasionally a moderately developed jugular bulb is formed where the sinus turns around a sharp bony projection. (3) In other cases, the bulb is unusually well developed. It takes in the entire height of the pyramid and the wall directed toward the cranial cavity may be as thin as paper. In the first case, the bulb is separated from the floor of the tympanum by a layer of bone from .75 to .50 *cm* thick. In the case under subdivision 2, the bulb forms the floor of the tympanum and may even extend under the internal tympanic wall. In marked development, the bulb may rise above the level of the oval window and the floor of the tympanum appears as if it were pushed upward. In the last case, the extreme projection of the tympanum causes great danger of infection, which is increased because on account of the more or less anteriorly displaced sinus the antrum is very small and there are no diploic cells. DENKER.

39. Grunert writes in his paper: "The ligation of the internal jugular vein is indicated not in the sense of Zaufal in order to exclude the chances of metastasis, but to overcome the chief danger of tamponing the sinus as a preparatory operation to opening the sinus, and especially when on its exposure the latter appears externally diseased."

As this view of Grunert seems to imply that ZAUFAL had found the value of ligating the internal jugular vein only in those cases pointed out by Grunert, the author recalls a previous publication of his in which he recommends the operation of ligation as a preliminary to the operation of opening the sinus. DENKER.

NERVOUS APPARATUS.

40. **Haike.** A fœtal disease of the labyrinth consecutive to hemorrhagic encephalitis. *Arch. f. Ohrenheilk.*, vol. lv., p. 36.

41. **Gescheit.** On Ménière's disease, with a description of a healed case. *Berliner klin. Wochenschr.*, No. 14, 1902.

42. **Wiebe.** On hysterical deafness. *Arch. f. klin. Medicin*, vol. lxxi., 1901.

43. **Daae.** Acute suppurative otitis media, osteo-myelitis of the mastoid, epidural abscess, sinus phlebitis; operation and healing. *Norsk Magazin for Lägevidenskaben*, vol. lxii., No. 8.

40. The author had the opportunity of examining the ears of a child which died on the fourth day and which had suffered from intrauterine hemorrhagic encephalitis, with complete defect of both cerebral hemispheres. He was able to show that intrauterine cerebral morbid processes cause secondary changes in the ear which have formerly frequently been taken for congenital anomalies. The changes in the labyrinth were not produced by the extension of the inflammatory process from the brain to the internal ear, but were the results of mechanical traumatisms from the hemorrhages. The hemorrhage on both sides must have started in the internal auditory canal and it almost completely divided the cochlear nerve. The spiral ganglion showed large defects where no tissue elements could be recognized. The vestibular nerve was much less affected. The vestibular ganglion was normal. The greatest changes were found in the membranous cochlea; the neural epithelium was absent, presumably a degeneration of the centripetal nerves. There were no positive evidences of an inflammation. The pathological changes could be explained by a progressive degeneration.

DENKER.

41. The symptoms, etiology, and treatment of a case of Ménière's disease in a previously intact ear are described. The disease set in with deafness, tinnitus, vertigo, and attacks of vomiting, occasionally accompanied by unconsciousness. Treatment with the iodides and quinine was without result. The galvanic current after two sittings produced a marked improvement; complete recovery took place after twenty-five or thirty sittings so that the patient was able to resume his occupation as letter-carrier. MÜLLER.

42. The author reports on hysterical deafness, with a description of three severe cases in men, where the deafness in one case was due to idiopathic hysteria and in two to traumatic hysteria. In two cases there was an accompanying middle-ear affection.

BRUEHL.

43. The interesting feature of this case is that two weeks after the operation, where a thrombus had been evacuated on one side,

symptoms of thrombosis appeared on the other side, which however disappeared on rest in bed and antiphlogistic treatment.

JÖRGEN MÖLLER.

NOSE AND NASO-PHARYNX.

a.—METHODS OF EXAMINATION AND TREATMENT.

44. **Pontopiddan.** On adrenalin in surgery of the nose. *Ugeskritt for Läger*, No. 18, 1892.

45. **Suchanek.** On forman and its application. *Fortschritte d. Medicin*, No. 3, 1892.

46. **Wroblewski.** On anæsthesia of the mucous membranes with a 25 % alcoholic solution of cocaine in operations on the nose, pharynx, and larynx. *Arch. f. Laryng.*, xii., 3.

47. **Lepa.** Amyloform, a specific against coryza. *Wiener med. Blätter*, 1902, No. 5.

48. **Ephraim.** On the endonasal treatment of dysmenorrhœa. *Allgem. med. Centralztg.*, No. 20–21, 1902.

49. **Polyak.** Probing of the nasal lachrymal duct through the nose. *Arch. f. Laryng.*, xii., 3.

44. The author is very much pleased with adrenalin and thinks it also has an anæsthetic action, although he usually combines it with cocaine. JÖRGEN MÖLLER.

45. SUCHANEK has made further trials with forman pastilles and has had gratifying results from their use in the treatment of coryza. BRUEHL.

46. The author recommends the use of a 25 % alcoholic, in place of the usual 10–20 % watery, solution of cocaine. The alcohol is supposed to act as an antidote to the cocaine poisoning and aids in anæsthetic and disinfecting purposes.

ZARNIKO.

47. The author has personally used with success in coryza a powder consisting of equal parts of amyloform and amyli oryzæ.

BRUEHL.

48. Induced by the favorable results of Fliess, Koblank, Schiff, and others in cauterizing and cocainizing the genital zones in the nose (anterior extremity of inferior turbinal and tuberculum septi) in dysmenorrhœa, the author has experimented on twenty-four women. In eighteen cases he achieved great success by cocainizing with 20 % solution of cocaine. Suggestive action could be excluded as applications of water were used as a control. The author thinks that there is a specific connection

between certain areas of the nose and dysmenorrhœa through the sympathetic, spinal, and cerebral nerves. The menstrual irritation of the nasal mucous membrane can produce reflexly marked painful uterine contractions, which are diminished after application of cocaine to the nasal site. BRUEHL.

49. The author gives the illustrations of a number of probes with which he directly, or after a small preparatory operation, probes the nasal lachrymal duct from the inferior meatus. Other pointed probes serve to separate adhesions, and canulæ are employed to irrigate the canal. The procedure is recommended in those cases of stenosis of the nasal lachrymal duct and in purulent otorrhœa and otitis which are not too old, where a nasal origin seems probable and which have been treated without success by other methods. The contra-indications are high-seated stenosis, very marked contraction of the lachrymal sac, in the case of sucklings and infants. These deductions are not final, as the author has not been able to test the new method on a sufficiently large clinical material. ZARNIKO.

b.—OZÆNA.

50. **Schönemann.** On transformation (metaplasia) of cylindrical epithelium and squamous epithelium in the human nasal cavity and its importance in the etiology of ozæna. *Virchow's Arch.*, vol. clxviii.

51. **Klemperer** and **Schleier.** On the identity of the ozæna bacillus and of the rhinoscleroma bacillus with Friedländer's bacillus. *Zeitschrift f. klin. Medicin*, vol. xlv., 1902.

50. The author, on Siebenmann's incitation, examined the presence of metaplasia in 83 cadavers. The measurements show that a narrow upper face is always associated with a narrow nose. In 63 % there was a broad, and in 37 % a narrow nose. Broad faces were more frequent in women. In 34 broad-nosed cases, turbinal atrophy was present in 32 %; in 44 narrow noses, in 38 %; in other words, turbinal atrophy is less frequent in broad noses. The spurs did not enter into the etiology of the atrophy, for in 20 atrophic noses 68 % had no spurs and 32 % had short ones. Narrow noses were more frequently associated with sinus empyema than broad noses. In 18 tuberculous individuals, 75 % showed narrow noses, 42 % turbinal atrophy, 26 % empyema. In the histological investigation of the eighty-three noses, the anterior and posterior extremities of each turbinal were examined and showed that metaplasia is a comparatively frequent occurrence. The site of preference seems to be the an-

terior extremity of the middle turbinal. Metaplasia is not essential for the presence of ozæna, although it is frequently associated with the latter condition. The ozæna odor is caused by degenerative changes of the secretion. Ozæna is the result of manifold inflammatory processes which first attack the surface of the mucous membrane and then produce connective-tissue hypertrophy and secondarily degenerations. Disturbances of circulation, congenital platyrrhinia, and nervous influences on Bowman's glands with diphtheria seem to be the favoring agents. Pus flowing from the middle meatus may cause secondary ozæna. With E. Fraenkel, the author regards ozæna as the terminal stage in chronic inflammatory processes of the nasal mucous membrane and the underlying tissues where the glandular elements have degenerated by atrophy.

51. Ozæna and rhinoscleroma bacilli show complete identity with Friedländer's bacillus, which may occur in the normal respiratory passages and in other diseases, and is not specific for ozæna and rhinoscleroma. The name, ozæna and rhinoscleroma bacillus, should hence be dropped, as these are identical with Friedländer's bacillus. BRUEHL.

c.—TUMORS.

52. **Hajek.** Why do nasal polypi recur? *Wiener med. Presse*, No. 10, 1902.

53. **Jurasz.** A mucous polyp arising from the right tubal ridge. *Monatsschr. f. Ohrenheilk.*, No. 6, 1901.

52. In a very clear paper HAJEK answers this question as follows: 1. Because generally not all polypi are removed *in toto*. 2. Because the empyema, which gives the inflammatory cause for the development of polypi, is overlooked. 3. Because the periosteum of the bone from which the polypi took their origin was diseased, and new polypi develop from remaining cellular infiltrations of the medullary spaces. BRUEHL.

53. A true mucous polyp as large as a walnut, arising from the tubal ridge above the tubal opening, was removed by forceps by way of the mouth under the guidance of a mirror. The diagnosis was confirmed by the microscope, and the case is of interest on account of the unusual location of the tumor. PIFFL.

d.—ACCESSORY SINUSES.

54. **Emmenegger.** On the operation for purulent disease of the maxillary sinus, with special regard to supraturbinal resection (Siebenmann). *Inaug. Diss.*, Basel, 1900.

55. **Guye.** Four cases of exenteration of the sphenoidal cavities in relapsing nasal polypi. *Berlin. klin. Wochenschr.*, 1902, No. 8.

56. **Reichert.** On a new method of examining the maxillary antrum by the aid of the antroscope. *Berlin. klin. Wochenschr.* 1902, No. 18.

57. **Grünwald.** Intervertebral abscess arising from suppuration of the accessory sphenoidal cavity, with numerous complications. *Arch. f. Laryng.*, xii., 3.

54. After reviewing the anatomical relations and discussing the usual methods in vogue, the author describes the results obtained in Siebenmann's clinic by the method of supraturbinal resection (pressing in of the medial sinus wall with the small finger). In ten case-histories, nine were those of chronic, one of acute, suppuration. Two were completely healed, eight were improved. The importance of the method is supposed to be of equal value to the patient with relatively less discomfort as compared with the usually so-called radical procedures.

BRÜEHL.

55. In two of the cases, the chief symptom, in addition to the relapsing polypi, was the obstinate headache; this was absent in the last case. In all four cases, opening, with curetting of the sphenoidal cavities, caused rapid disappearance of all symptoms. The interesting feature of one of the cases was the appearance of a large elastic tumor on the left side of the nasal septum, which, on puncture, evacuated, not pus, but a pale serum, and disappeared a few days after opening the sphenoidal cavity. The author thinks that this represented an unusual extension of the sphenoidal cavity into the septum, and speaks of four similar cases recently described by Sieur and Jacob. MUELLER.

56. The author has constructed an instrument which can be passed through a canal 8 *mm* wide, made through the alveolus. The instrument resembles in its workings the Nitze cystoscope. In three cases of chronic maxillary empyema, REICHERT was able to observe polypi situated at the maxillary opening, and in one case a cyst. BRUEHL.

57. After a report of the history of this truly unusual case, the author makes the following remarks: "The accessory sphenoidal cavity probably became diseased many years ago, to which the old naso-pharyngeal catarrh points. The suppuration and increased congestion followed the bone in the deep parts of the neck, indicating the beginning of the prevertebral abscess situated at the apex of the atlas. This then became intervertebral, and from the

atlas worked its way externally. The middle ear became infected so that the suppuration from this source occupied all attention for some time. After the perforation of the abscess externally, the discharge of pus into the throat ceased. The combination between external aural suppuration and that of the sphenoid seemed assured, not by way of the natural, but by way of the accessory cavity, the presence of which was, of course, entirely unsuspected, as this case, to my knowledge, is the first communication on the existence of such a cavity. The patient suffered from cardiac and arterial sclerotic changes, and underwent in the course of one year seven severe operations with considerable loss of blood, finally succumbing to an operation on the cervical cord. During this entire period very few variations in temperature were recorded. ZARNIKO.

e.—OTHER DISEASES.

58. **Holländer.** On the question of the mechanical disposition to tuberculosis, with results of plastic operations for nasal lupus. *Berliner klin. Wochenschr.*, No. 14, 1902.

59. **Koenig.** On covering defects in the nasal alæ. *Berl. klin. Wochenschr.*, 1902, No. 7.

60. **Neumann.** Virulent diphtheria bacilli in simple rhinitis. *Centralbl. f. Bact.*, xxxi., No. 2.

61. **Gutmann.** A case of fatal epistaxis. *Wratschebnaja Gaseta*, No. 52 1901.

62. **Mygind.** A case of sudden collapse with cessation of respiration and cyanosis (spasm of the glottis), following operation for adenoids; tracheotomy recovery. *Hospitalstidende*, No. 18, p. 465, 1902.

58. The chief reason for the extension of the lupus process from the nose to the mucous membrane of the respiratory passages, according to the author, lies in the mechanical obstruction to the nasal respiration either by destruction of the cartilaginous framework of the nose and nasal entrance or by incorrect operations. Unquestionably on obstructing normal nasal respiration a most favorable culture medium for the development of the bacillus is furnished. The lupus process in the upper respiratory passages may consequently heal if the primary nasal lesion has been cured and the stenosis of the nasal orifice is overcome. The author has observed three times a severe relapse of a healed nasal lupus if after an incorrect rhinoplasty the nose again becomes occluded.

MUELLER.

59. **Koenig** recommends a procedure which gives a good cosmetic result in defects of the nasal alæ after lupus. He excised from the substance of the auricle—which in its structure anatomically resembles the nasal ala—a flap and sutured it in the nasal defect. The margins of the auricular wound were adapted and sutured without markedly deforming the auricle. **Bruehl.**

60. **Neumann** found in the purulent secretion of simple coryza virulent diphtheria bacilli without the appearance of a membrane in the nose or throat. He believes that primary nasal diphtheria occurs more frequently as simple coryza without a membrane, and recommends, on account of their infectiousness, that all suspicious coryzas be examined bacteriologically. The pseudo-diphtheria bacillus is without importance. **Bruehl.**

61. The cause of this very severe epistaxis was not explained. A boy, sixteen years old, was always healthy and had never previously suffered from nosebleed. The day previous he had climbed a tree and very soon after this the bleeding began. The hemorrhage stopped after tamponing, but the patient succumbed after two hours. **Sacher.**

62. Two cases are reported where, following an adenotomy, laryngeal spasm developed, which, however, only lasted half a minute. During this short interval the symptoms were so alarming that tracheotomy was thought of. A similar case entered the hospital August 28, 1901,—a very rachitic child who was operated on with Beckman's curette. On removing the vegetations, the child collapsed and respiration ceased, the lips becoming very cyanotic. There was no stridor, no respiratory movements, and no bleeding. As the vegetations did not appear, it was at first thought that they had fallen into the larynx. This, however, was found not to be the case. Various manipulations were undertaken to stimulate respiration, but without result. Inferior tracheotomy was performed, after which respiration began again. On closing the canula it was then noted that the child could easily respire. The canula, however, was not removed until October 9th. The case resembles one reported by Flatau. He thought that the collapse was a primary one caused by operative interference. A second later laryngo-spasm set in. The mother afterwards stated that the child had had similar laryngo-spastic attacks which were sometimes so severe that the child was supposed to be dead. **Jörgen Möller.**

PHARYNX AND BUCCAL CAVITY.

63. **Heermann.** To check hemorrhage after tonsillotomy. *Arch. f. Laryng.*, xii., 3.
64. **Veis.** On the cure of pharyngeal tuberculosis. *Arch. f. Laryng.*, xii., 3.

63. To suture the two pillars of the tonsil together with two sutures is the best method of arresting hemorrhage.

ZARNIKO.

64. The author has cured five cases of pharyngeal tuberculosis by surgical means and cauterization with trichloracetic acid. He considers that he is thereby justified in saying that pharyngeal tuberculosis is in general much more benign than is usually believed and that "therapeutic nihilism is not at all justified."

ZARNIKO.

BOOK NOTICES.

XI. **Diseases of the Throat, Nose, and Ear.** By C. P. GRAYSON, M.D., Lecturer on Laryngology and Rhinology in the University of Pennsylvania, etc. Published by Lea Bros., Philadelphia, 1902. Pp. 530. Price $3.50 nett.

The author has aimed to make simplicity in describing the methods of treatment a feature in this book by outlining as far as possible only one line of treatment under each disease. Aside from this excellent idea, it seems to us that the subjects which the author has attempted to describe are altogether too large to include in one book such as the one before us. The nose, pharynx, larynx, and ear are treated in 530 pages with large and heavily leaded print. As a consequence, though many chapters are admirably treated, others are found incomplete and unsatisfactory for the use of specialists. The descriptions of the anatomy of the nose and accessory cavities are facilitated by full-page illustrations from Dr. Cryer's *Studies of the Anatomy of the Face.* A. K.

XII. **Essentials of Diseases of the Ear.** By E. B. GLEASON, M.D. *Saunders's Question Compends. Third edition.* W. B. Saunders & Co., Philadelphia, 1902. Pp. 207. Price $1.00 nett.

The new edition of this compend has been thoroughly revised. It is unusually complete and the brief treatment of the subject in the form of questions and answers serves a number of useful purposes. Aside from its practicability for medical students it can be recommended as an introduction to the more comprehensive text-books. A. K.

EDITORIAL NOTICE.

The **Archives of Otology** is a bi-monthly journal, published in annual volumes of about six hundred pages each, extensively illustrated with cuts in the text, half-tone text plates, and lithographic plates, many in colors. About three-quarters of the space is devoted to original papers, and the remaining quarter to a systematic report on the progress of otology, and to reports of societies, book reviews, and miscellaneous notes. The papers and reports are original, and only accepted with the understanding that they are to be published in this journal exclusively. The original papers in the English edition appear in the German (*Zeitschrift für Ohrenheilkunde*) either in full or in more or less abridged translations, and *vice versa.* Any subscriber who wishes to refer to the original text of a translated or abridged paper may, by applying to the editor, obtain a reprint which he is expected to return after perusal.

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VOL. XXXI. No. 6.

ARCHIVES OF OTOLOGY.

MULTIPLE SINUS THROMBOSIS; CEREBELLAR ABSCESS AND MENINGITIS, PROBABLY ORIGINATING FROM AN OSTEO-MYELITIS OF THE SPHENOID.

By Dr. HAROLD WILSON, Detroit, Mich.

(*With two figures on Text-plate II., and a temperature chart in the text.*)

Wm. M., coachman, æt. thirty-four, consulted the writer April 12, 1902.

History.—Father died many years ago from diphtheria. Mother, one brother, and four sisters living and in fair health. Personal health generally good. Eight or ten years ago had a rather large glandular swelling on one side of the neck (left?), which finally disappeared spontaneously. Many years ago had ulcer of right cornea, leaving a scar with marked impairment of vision. Four years ago, under the writer's care, had an acute suppurative otitis media of both ears, requiring paracentesis of both membranæ tympani, and running an ordinary course, the discharge altogether ceasing in two or three weeks. There had been no discharge from either ear nor aural trouble of any kind, either previously or since. Has had an atrophic rhinitis of an ordinary type for several years. For several months past has suffered at times with a severe headache not very definitely localized. Has used alcoholic liquor to excess at various times during the last four years. No history of syphilis.

Present Illness.—About three weeks previously, that is, about March 22d, the patient was taken with a severe pain in the left side of the head toward the occiput, accompanied with tenderness on pressure over the affected region, and with pronounced stiffness of the neck. There had been slight chilliness at various times, and on April 11th, the day preceding his visit, he had a severe chill lasting an hour. The pain had been more or less severe and constant, although the patient had kept at work most of the time since the illness began.

Examination.—The skin of the left side of the neck was reddened from the domestic application of tincture of iodine a few days before. There was a marked tenderness to pressure over the posterior portion of the mastoid and over the upper portion of the posterior cervical triangle. Movements of the head occasioned pain in the posterior muscles of the left side of the neck. There was no œdema. No perceptible enlargement of the cervical glands. No tenderness on pressure over the internal jugular vein. No unusual tenderness on pressure upon the mastoid immediately back of the auricle. The membrana tympani seemed slightly reddened. Temperature 102.8°. Pulse 96. The patient was admitted to The Grace Hospital April 12th at 3 P.M.

First Operation.—Under chloroform anæsthesia the left mastoid antrum was opened. The tympanic attic and the cells of the mastoid were thoroughly explored without finding any apparent abnormality. There was neither pus nor granulation tissue. Bleeding was unduly free, rendering the exploration difficult.

Subsequent Course.—Following the operation the patient was very comfortable for about thirty-six hours. The pain in the left side of the head subsided, and the temperature fell to normal at noon of April 14th, having risen only to 100.4° on the day previous. Early in the evening of the 14th the patient was seized with a severe pain in the region of the left ear and had a pronounced chill lasting probably an hour, the temperature rising to 102°. The wound was re-dressed and inspected, but was found to be clean. The bleeding occasioned by the removal of the packing was much more free than usual. In the afternoon of April 17th the temperature rose to 104.4°, the pulse being 98, with more pain in the head. On April 17th, at 5 P.M., there was another pronounced chill, the temperature reaching 104°, with a pulse of 102, very little perspiration following. A slight chill occurred April 18th, at 2 P.M., with a temperature of 104°; pulse 98. Heretofore, outside of the local symptoms, the patient had been feeling very well, but now he began to lose strength, feeling weak and tired. At times he perspired freely, but the act of perspiration was not sensibly debilitating. After a conference with Dr. O. LeSeure, 24 grains of quinine were given in divided doses. An examination of the urine showed nothing abnormal. The diazo

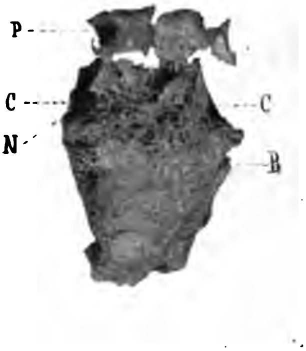


FIG. 1.—Postero-superior aspect of the body of the sphenoid. P, Posterior clinoid processes, much eroded, both having completely separated and being now merely pinned in place. C, Groove for cavernous sinus. N, Groove for sixth nerve. B, Body of the bone showing the rather extensive erosion of its surface and substance.

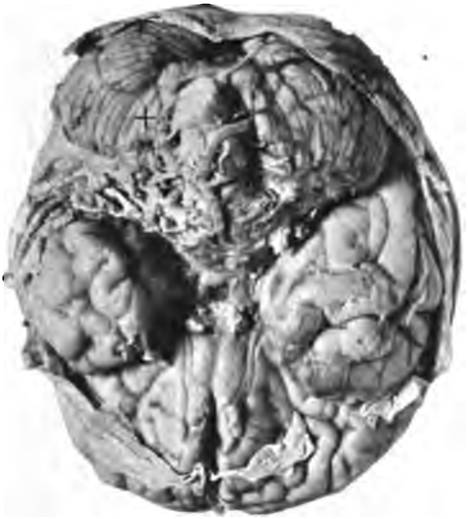
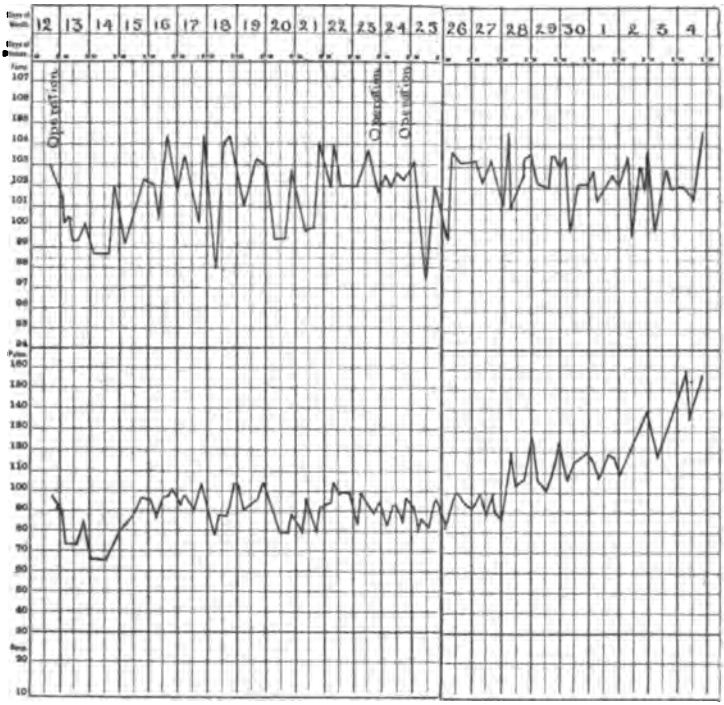


FIG. 2.—Inferior aspect of the brain, showing the thickened and infiltrated tissues on the left side in the neighborhood of the pons. The cross shows the location of the abscess in the cerebellum.

reaction could not be obtained. An examination of the blood for the plasmodium malariæ was negative. On the 22d Dr. Eugene Smith examined the patient at my request. Ophthalmoscopic examination in the right eye was difficult owing to the old opacity and irregularity of the cornea. Yet it was possible to affirm that there was no papillitis, and that the veins were somewhat enlarged and tortuous. In the left eye, the outlines of the disc along its upper nasal border were obscure. No evidences of neuritis. The muscles of the neck were stiff and very painful upon motion of the head. There was marked tenderness upon pressure over the upper part of the posterior cervical triangles on both sides. No glandular swelling and no induration or tenderness along the course of either internal jugular vein. The patient had several slight chills during the previous few days. He was drowsy and slept a good deal. For a few days (even previous to the administration of quinine) there had been a somewhat



conspicuous hardness of hearing. The sitting posture caused faintness and slight gastric distress. There was no vertigo, nor any disturbances of motility beyond the general weakness. The pain in the head was not ordinarily very severe, but was now worse on the right side. The left pupil was slightly dilated and sluggish.

Second Operation.—April 23d at 5 P.M., lasting about two hours. The dressings were removed from the mastoid and the left sigmoid sinus was exposed by extending the mastoid wound backward. The sinus was exposed from the knee downward for three-quarters of an inch or more. It lay unusually deep and was reached only after considerable labor. It did not pulsate; its walls were smooth and elastic, and of a light gray color, giving no sense of hardness to the touch of a probe. An aspirating needle was then passed into the sinus and about twenty minims of fluid withdrawn, the first half of which was dark blood or bloody fluid, the last half, pus. The sinus was then opened by a slit along the entire length of the exposed portion. Upon introducing the curette, several drachms of pus escaped apparently from the bulbar end, and in curetting toward the torcular end of the sinus, free hemorrhage occurred. This soon ceased under pressure, but recurred upon the renewal of the curetting, preventing further exploration. The wound was packed with iodoform gauze. Bacteriological examination of the pus by Dr. Stricker showed staphylococcus but no streptococcus.

Following the operation, there was no essential improvement in the patient's condition. Pain and tenderness on pressure over the upper part of the right posterior cervical triangle continuing, it was resolved to explore the right sigmoid sinus.

Third Operation.—April 24th, lasting one and a half hours. The right sigmoid sinus was opened at the knee. There was no apparent thrombosis, and on opening the sinus the hemorrhage was free. The wound was accordingly packed with gauze and the patient returned to bed.

Subsequent Course.—Following this operation the condition of the patient steadily grew worse. The pain and stiffness of the neck continued. There was more or less abundant perspiration. There was a slight chill April 25th, and during the ensuing night there was an involuntary stool, small and fluid, due possibly in some measure to the saline enemas that had been given several times during the day. About twenty-four hours afterward, however, another similar involuntary stool occurred. The pain and suffering gradually diminished, the patient being constantly drowsy and sleeping much of the time. There was a slight chill on the 28th. On this date the deafness was increased. The lower half of the conjunctiva of the left eye became œdematous with a yellowish discoloration of the sclera. Upon re-dressing the wounds, about two drachms of pus escaped from the left sigmoid sinus. The chemosis of the left eye increased steadily and the eyeball began to protrude, the proptosis becoming extreme in about forty-eight hours after the conjunctival œdema was first observed. April 29th, the protrusion and swelling were so great that the upper lid could be lifted with the finger, only to a very slight extent; moreover the levator muscle of this lid was paralyzed. There was no observable paralysis of the bulbar muscles. The pupil was not much dilated but was stabile. Upon this date, three days after the first appearance of chemosis in the left eye, the upper lid of the right eye showed a beginning œdema. Stools were small, very relaxed, and frequent. At times there was a slight delirium. No retraction of the head or yawning. Nourishment was generally refused, although small quantities of milk were occasionally taken. There was occasional twitching and jerking of the extremities, especially the left hand and shoulder and the left side of the face. The patient was in a drowsy, semicomatose condition, but could be aroused and was then usually rational, although not sensible of the gravity of his condition. His speech became thick, palatal, and difficult to understand. There was also difficulty in swallowing, although there was no return of fluid through the nose when drinking. The stools and the passage of urine became involuntary. The œdema and protrusion of the right eye became moderately increased, with a yellowish discoloration of the lower half of the globe similar to that already noted in the other eye. In the left eye the œdema and proptosis lessened so that the upper lid could be easily raised with the finger, exposing the eyeball, which was fixed in position in consequence of the total ophthalmoplegia now observable. The pupil was stabile and only moderately dilated. There was now a slight loose cough with a thick frothy expectoration, without blood stain. The left frontal vein became conspicuously dilated, showing as a raised streak extending from the inner angle of the left orbit obliquely upward and inward. Respiration was regular but oral and noisy, becoming more and more rapid, rising to 56 per minute. The patient gradually grew weaker and more comatose and died May 4th, at 10 P.M.

Autopsy.—May 5th, 7 A.M. Examination restricted to head. The proptosis had disappeared. The removal of the skull-cap was difficult, owing to the firm adhesions of the dura to the bone over more or less of the entire convexity, and in spite of care, the meninges at the base of the brain were considerably lacerated. The dura mater was thickened over the cerebrum, especially along the superior longitudinal sinus. The pia was also thickened, inflamed, and adherent along the convolutions of the superior longitudinal fissure. The walls of the longitudinal fissure, over its posterior half, and the *falx cerebri* were brightly congested. The *tentorium* of the left side was inflamed and adherent. The soft tissues about the knee of the left sigmoid sinus were necrotic and thoroughly infiltrated with pus. Upon the posterior aspect of the right cerebellum, at the site of the operation on that side, the dura was reddened and infiltrated. The entire lower surface of the brain lying in the middle fossa, was bathed with a thick, creamy pus, which was abundant and pervasive. So much of this pus escaped upon removing the brain from the skull, that it was impossible to determine with accuracy its original limits. However, it was evident that the sigmoid, superior and inferior petrosal and cavernous sinuses of the left side, the cavernous, superior and (probably) the inferior petrosal of the right side, together with the circular and transverse sinuses, were filled with pus, and that some of the pus covering the pons, medulla, and other basilar structures was due to a suppurative basilar lepto-meningitis. The pus was offensive. There were no erosions or other bony lesions in the floor of the cranial fossæ except in the sphenoid, as will be noted a little farther on. Except for the operative openings in the two sigmoid grooves, the inner surface of both temporal bones was apparently entirely normal. There was a firm decolorized clot in the left jugular bulb; a soft clot and some blood in the right bulb; a firm organized clot in the right lateral sinus, extending from the knee $\frac{1}{2}$–$\frac{3}{4}$ in. toward the torcular; and a degenerating clot in the left lateral sinus. There was also a firm thrombus in the anterior half of the superior longitudinal sinus, extending into a number of the adjacent contributory vessels on either side. The inferior portion of the right temporo-sphenoidal lobe was congested, with a number of dark reddish discolored spots or areas on its lower surface. Upon opening the lateral ventricles, the left choroidal plexus was found reddened and enlarged. A small abscess containing about two drachms of pus was found in the anterior inferior portion of the left lobe of the cerebellum. It was not encapsulated and was evidently of recent formation. The substance of the brain generally was not noticeably abnormal. There was no pus contained in the ventricles. The surface of the brain was not stained, so far as the writer could see, by any of the numerous thrombosed sinuses, nor was there any discoloration of the bony grooves for these sinuses.

The superior posterior portion of the body of the sphenoidal bone, the dorsum sellæ, was discolored, softened, and eroded (Fig. 1, Text-plate II). The carious degeneration was such that the posterior clinoid processes had fractured and separated from the bone in the process of removing the calvarium, and remained adherent to the dura. The body of the bone was infiltrated with pus in the neighborhood of the carious portions. The soft tissues lining the large cell beneath the pituitary body were injected upon the right side. It is uncertain as to whether the pus in this cell did not get there in the process of cutting out the piece of bone containing it. The spinal cord was not examined except at its upper end, but it appeared normal.

Remarks.—When this patient first presented himself for treatment, the history of a previous suppurative otitis media, although it had been an acute attack, and although four years had elapsed with no discharge, made it seem probable that the difficulty lay in the mastoid. It would have been better surgery perhaps to have exposed and inspected the lateral sinus when pus was not found in the antrum or mastoid cells, but the operation had been difficult and somewhat prolonged, and the hemorrhage from the wound was so profuse and annoying that it seemed wiser to postpone further explorations at the time. Subsequently, the occurrence of chills and the remittent and variable temperature (see chart) made the diagnosis of sinus thrombosis extremely probable, so that the second operation could, and perhaps should, have been made earlier. A delay was agreed to in order to eliminate the possibility of typhoid or malarial infection. This was the more justifiable in consequence of the negative evidence as to an aural or any other definite source of infection. This lack of any apparent reason for the existence of sinus thrombosis naturally created some difficulty in accepting the diagnosis and made some process of exclusion necessary to its establishment.

The pulse was not strikingly "cerebral," but was disproportionately low when compared with the maxima of temperature, showing probably a slight increase in the pressure upon the brain.

It is a question of great interest as to the original source of infection and the precise point at which the disease began. The information furnished by the autopsy does not furnish an absolutely certain solution, but it provides the basis for an hypothesis. The body of the sphenoid bone presented the appearance of having been affected with an osteo-myelitis. Some idea of its condition may be obtained from the accompanying photograph. The conditions of the autopsy prevented a more extensive specimen being taken, but the disease seemed to be confined to the piece that was removed. The erosions were confined to the surfaces shown in the illustration; the sella turcica and the internal walls of the sphenoidal cells were smooth and normal, although the body of the bone even where it was not eroded was considerably discolored. Such a disease of the sphenoid might have originated from an infection coming from without, by way of the nasal passages, the route being a very direct one, or from an infection coming from within, from the infected sinuses lying in its immediate vicinity. There was an extensive degeneration of the dorsum sellæ, the substance of the bone being filled with pus and its surface irregularly and deeply eroded. It is probably impossible to say how long a time such a degeneration would require for its development. The breaking down of loose cancellous bone may however take place with comparative rapidity. Between the first symptoms showing occlusion of the left cavernous sinus and the autopsy, some 9–10 days elapsed—hardly time enough for very marked destruction of the bone. If this osteitis were secondary to the thrombosis of the sinuses in its vicinity, it is reasonable to inquire why it does not more commonly occur in other cases, or why in this case it did not take place in the neighborhood of the left sigmoid sinus, in the temporal bone for example, where it was open to infection by the operative exposure of the sinus. Yet there was no visible lesion of the bony walls of the skull besides that in the sphenoid. Moreover, if the osteitis were secondary to the sinus infection, the origin of this remains unsettled.

Assuming that the osteitis were primary to the sinus infection, it is not even then easy to elucidate the precise progress of the disease. We may suppose that a suppurative osteo-myelitis of the dorsum sellæ might exist for some time without definite localizing symptoms. This patient had been ill with headache, stiffness and tenderness of the posterior cervical region, fever and chills indicative of some suppurative affection for at least three weeks (probably longer) before he was seen by the writer. Sinus infection might have first occurred in the basilar plexus, extending from there to the left inferior petrosal sinus and then occluding the left jugular bulb. The subsequent thrombosis and disintegration of the clots in the various other sinuses would then naturally be determined by their contiguity with the infected areas and by the course of the currents of blood in those vessels not yet occluded. It might seem in view of such an hypothesis that the cavernous sinuses ought to have been infected earlier than they were. The œdema and protrusion of the eyeball fix the time of this involvement pretty definitely. But the flow of blood through the petrosal sinuses being in a direction away from the cavernous and circular sinuses, might have prevented their infection until the flow was arrested by the progressive occlusion. The basilar meningitis was probably secondary and of later development.

In view of the pathological conditions revealed by the autopsy, it seems evident that the operations performed were useless, although they were abundantly justified by the symptoms present at the time. Even had there been an exact foreknowledge of the pathological conditions present, it is improbable that any surgical means would have prevented the fatal issue.

CONTRIBUTION ON OTOGENOUS DISEASE OF THE BRAIN, MENINGES, AND VENOUS SINUSES.

(FROM PROF. KÖRNER'S CLINIC AT ROSTOCK.)

BY DR. STURM AND DR. SUCKSTORFF,

ASSISTANTS AT THE EAR CLINIC, ROSTOCK, GERMANY.

Translated and Abridged by Dr. ADOLPH O. PFINGST, Louisville, Ky.

(*Continued from page 490, Vol. XXX., of these* ARCHIVES.)

Case 44. — Mastoiditis accompanying acute suppurative otitis media in a diabetic subject. Extradural abscesses in the middle and posterior cranial fossæ, unaccompanied by symptoms. Operation. Recovery.

A male, fifty-three years old, in good health until seven years ago, when he emaciated rapidly and had every symptom of diabetes. Since then he has kept a strict diet and has about held his own, being able to follow his vocation as teacher. August 15, 1901, he was suddenly seized with severe pain in the right ear. The pain was deep seated and after several days radiated towards the temple and the neck. It was worse at night. Spontaneous rupture of the drum two days later and a free discharge of pus failed to relieve the pain. When examined August 22, 1901, at the clinic, the right ear-canal was filled with odorless pus. After cleansing the canal a sausage-like swelling of the upper posterior wall extending the entire length and reaching half-way across the canal could readily be seen. Internally it covered half of the drum. A pulsating reflex indicated a perforation in the lower half of the drum. The patient could hear a whisper at 1½ feet. The temperature at this time was 36.7°, pulse 70. There were no symptoms to indicate brain or meningeal complications. The urine contained 11.5 per cent. of sugar; no albumen.

The acute pain and otorrhœa of six weeks' standing with the unusually large swelling of the upper-posterior wall of the ear canal left little doubt of the diagnosis of acute mastoiditis, so that an operation was decided on. The exposed mastoid showed several bleeding points but no discoloration of bone. The chisel was applied over the region of the antrum. Removal of a thin cortex exposed a very vascular diploë. Pneumatic cells were only found near the antrum, and they were filled with thick polypoid mucous membrane and pus. The intervening trabeculi of bone had softened. The antrum was filled with pus. The tegmen antri had been entirely destroyed, and pus was discharging from between the dura and the bone above the opening. The dura was covered with granulation tissue. From the antrum a fistulous tract led into the swelling of the upper ear-canal, which contained pus. The hyperæmic diploë of the mastoid extended back as far as the sigmoid groove. This contained pus which had separated the lateral sinus from the groove. The sinus and the dura of the middle cranial fossa were exposed as far as they were covered with granulation tissue.

This case made a rapid recovery. In fourteen days the perforation in the drum had closed, and thirty-three days after the operation the entire wound had cicatrized. The patient was on a strict diet during the period of after-treatment.

This is the sixth case of mastoiditis observed by Körner in diabetic subjects and the fifth one upon which he has operated.

Case 45.—Perisinuous abscess the result of mastoiditis occurring in subacute middle-ear inflammation. Abducent paralysis and a marked choked disc in both eyes occurring simultaneously after evacuation of the abscess. Recovery.

A female, twelve years old, gave a history of repeated attacks of tonsillitis and gradual loss of hearing. During the latter part of March, 1901, the right ear began to discharge pus. A few days later she began to complain of nausea and had frequent attacks of vomiting. These symptoms persisted and were present when she presented herself for treatment on April 9th. On April 7th a rather firm swelling appeared behind the ear, displacing the auricle forward. When admitted to the clinic, the mastoid bone was sensitive to pressure through the swelling. Pus discharge from the ear was so copious that the canal refilled rapidly after cleansing, making a study of the condition of the drum impossible. The patient was operated upon at once. On exposing the mastoid, granulations were found perforating the cortex over the region of the antrum. Upon enlarging this opening, the chisel came almost at once upon the lateral sinus, which was covered with granulation tissue. The entire bone was soft, the granulation tissue extending as far as the antrum, which was full of granulation and pus. All diseased structure was removed. The eyes, examined a few hours after the operation, showed normal fundi. The patient made a good though rather slow recovery, the wound closing by May 25th. During the healing, the temperature never rose above 37.5°, and usually remained at 36–37°. The child's general condition improved wonderfully and she gained considerably in weight. Thirteen days after the operation some noteworthy and unusual symptoms developed, referable to the eyes. On April 22d the child complained of diplopia, and examination revealed paralysis of the right abducens muscle. An examination of the interior of the eyes was made at the same time and a neuritis found on both sides, the elevation of the disc amounting to one dioptre. Both of these conditions grew steadily worse until about the middle of May. By June 10th muscular balance was restored, and by August all evidences of inflammation of the nerve had disappeared. An examination made in November showed that the child was in an excellent condition generally—the wound of operation had left a small scar, while the drum seemed perfect. Hearing was normal. The eyes were normal, vision being perfect. There were no signs of atrophy.

Remarks.—The complication in this case is hard to account for. The lateral sinus was found covered with granulation tissue at the time of the operation, yet there were neither local nor general signs of sinus thrombosis. Had there been any change in the optic discs previous to the operation, a temporary increase of the condition subsequently would not have been unlooked for, but to have the choked disc and paralysis coming on after evacuation of the intercranial abscess while the patient was improving rapidly in every other way is a circumstance hard to explain. This case demonstrates the importance of considering the general condition of a patient before suggesting an operation. Had Prof. Körner followed the suggestion of one of the ophthalmologists who examined this case instead of being influenced by the general improved condition of the patient, an exploratory operation to determine the cause of the choked disc would have been undertaken.

Case 46.—Mastoiditis after scarlet fever. Operation and unintentional exposure of the lateral sinus. Pyæmic fever beginning seventeen days after the operation. Ligation of the jugular and incision of the sinus. Continuance of fever and metastatic involvement of the shoulder joint. Recovery.

A boy, eight years old, while convalescing from scarlet fever was taken with severe pain in both ears. This was two weeks before he was seen at this clinic. The pain in the left ear subsided, but continued on the right side even after rupture of the drum and a free discharge of pus. No other symptoms were observed. When first seen at the clinic, the child appeared very frail and seemed about to collapse. In consequence of his condition it was almost impossible to make a thorough examination of his ear canal. From a casual examination, the upper wall of the ear canal appeared slightly swollen. The right mastoid was sensitive to pressure, especially over Bezold's groove and the emissary vein. The ear canal contained odorless muco-pus. Both submaxillary glands were enlarged. Temperature, 39.2°. Pulse, 120.

Operation Oct. 12th.—Upon exposing the mastoid, several vascular areas were seen in Bezold's groove. Removal of a very thin lamella of bone liberated pus. The cavity from which the pus exuded communicated with the antrum. This, as well as the cells along the posterior wall of the ear canal, was filled with pus. In fact, the entire mastoid process to the tip was made up of necrotic bone and pus. The bone was removed from the antrum to the tip. The lateral sinus, which was accidentally exposed, was apparently in a normal condition. The temperature soon returned to normal after the operation, though the pus discharge continued copious.

On the afternoon of Oct. 29th, the temperature suddenly rose to 40° without being preceded by a chill. By night it dropped to 38°. As it again rose to 40° on the next day the wound was examined. The exposed portion of sinus was covered with healthy granulations. More of the bone was removed and a greater area of sinus exposed. It was soft and healthy in appearance and showed respiratory movements. Normal blood was withdrawn with an aspirator. On the two following days the temperature still rose to 40.1–40.3°. On Nov. 1st the patient complained of pain at the base of the left lung. The possibility of pyæmia with metastatic abscess formation decided us to undertake the ligation of the jugular vein. This was done just above the facial vein. Subsequently the lateral sinus was incised, but nothing was found to account for the elevation of temperature. For the next week the afternoon temperature ranged from 38.1–to 38.6°. The general condition was fairly good. On Nov. 8th there was a sudden rise in the temperature to 39.4°. The patient complained of slight pain behind the right ear, otherwise the condition had remained unaltered. The wound seemed to be in good condition. The opening in the bone was again enlarged, the cavity being extended backward. A new portion of the sinus was aspirated. The blood withdrawn was normal. The temperature was now running a course typical of pyæmia, though there had never been a chill. The child became apathetic, lost his appetite, and complained of nausea and great thirst. On Nov. 9th, the left mastoid became sensitive to pressure, and on the following day the right elbow became painful and the shoulder joint sensitive on pressure. These symptoms subsided in several days and the general condition again improved. By Nov. 17th the patient was sitting up in bed playing. The wound was healing well. The eyes, examined at this time, as well as at several previous examinations, showed normal fundi. Changes in the background of the eyes began to show themselves on Nov. 21st, when the outlines of the papillæ appeared blurred. On Nov. 23d neuritis was marked, especially in the right eye. After Nov. 23d there was a gradual decline in the temperature, and the general condition of the patient began to improve. By Dec. 22d he was able to leave the clinic, although the wound had not quite closed. His general condition was excellent. The fundi of the eyes had returned to normal, and his vision was perfect.

Remarks.—The pyæmia in this case was probably the result of traumatism to the exposed sinus. The child was nervous and fought so hard at each dressing of the wound that the sinus was exposed to more traumatism than is usual in such cases. This probably resulted in a small marginal thrombus at the site of injury. The respiratory movement of the sinus was evidence that the vessel was nowhere completely blocked by a thrombus. The continuance of pyæmic temperature after ligation of the jugular and incision of the sinus can only be explained in one of two ways: either there was an infection through the cavernous, petrosal, or semicircular sinus to the vessels of the other side, or it took the body a long time to eliminate the fever-producing elements.

This case teaches us that the exposure of a large area of the sinus is not without danger. The exposure of a small portion for exploratory purposes is justifiable, but unnecessary exposure of a large area should be avoided.

Case 47.—Extradural abscess of the middle cranial fossa accompanying mastoiditis after acute otitis media. Recovery.

A male, forty-seven years old, was admitted for treatment June 20, 1901. He had complained of earache on the left side on April 3d, and was treated outside the clinic. There were redness and bulging of Shrapnell's membrane at the time, a serous exudate being evacuated on incision. On account of persistence of the pain paracentesis had been repeated on April 21st. After that he failed to return to his physician. When seen at our clinic for the first time he was having severe cutting pains in the left ear. The auditory canal contained a small quantity of pus. The posterior-superior wall of the canal was swollen. There was slight œdema over the mastoid and sensitiveness to pressure over Bezold's fossa. He was operated upon June 25th. The periosteum was found detached and bulging over the mastoid. Upon incision a quantity of pus discharged, which subsequently was found to be coming from a fistula in the posterior osseous ear-canal. The fistula led to a cavity in the mastoid, which extended upward as far as the necrosed tegmen. Removal of several small sequestra of bone exposed the dura, which was covered with rather firm reddish brown granulation tissue. No pulsation was visible. The fundi oculi were normal. This case made a good recovery, with restoration of function.

Case 48.—Extradural abscess of the middle cranial fossa accompanying chronic mastoiditis. Operation. Recovery.

Male, twenty-nine years old, gave history of neglected otorrhœa on left side of twenty years' standing. Since May 16th he had suffered from severe pain in the ear, accompanied since May 23d by swelling over the mastoid. He was first seen July 1st. The ear canal contained pus, and the upper posterior wall was so swollen as to make inspection of the drum impossible. The auricle was displaced forward by an extensive swelling of the soft parts behind it. Temperature was normal; pulse, 96. Eyes normal. Upon incising the soft parts to the bone an unusual amount of very offensive, thin pus was liberated. The wound was enlarged by a section forward to the attachment of the auricle. The bone externally was normal, but the posterior osseous wall of the auditory canal contained a fistulous opening. The mastoid was sclerotic, making it difficult to locate the antrum. It was finally entered from the tympanic cavity, an atypical radical operation having been decided upon. The tegmen tympani was necrotic, an irregular defect exposing the dura covered with granulation tissue. The necrotic ossicles were removed in cleansing the tympanic cavity. The wound was packed, the secondary operation of Stacke being done later. The patient made an uninterrupted recovery.

Case 49.—Chronic mastoiditis; extradural abscess of the middle cranial fossa. Operation. Recovery.

Male, fifty-six years old, had a running ear for over a year (left), the pus at times being streaked with blood. For several days the left ear had been painful especially when masticating. The ear canal, when he reported at the clinic on August 28th, contained offensive pus. A long polypoid mass almost occluded the canal. It was removed and subjected to a microscopic examination; was found to be made up of granulation tissue containing toward the interior numerous giant cells. The giant cells surrounded a number of minute bodies whose nature could not be determined. Notwithstanding the removal of the granulation tissue, followed by frequent irrigation, pus discharge became more copious and more offensive.

On September 10th and 11th the patient had increasing headache and complained of dizziness. There was no pain on palpation of the mastoid. The temperature was normal. Eye normal.

Operation: Skin section of Stacke; bone operation of Zaufal with secondary plastic. The mastoid was sclerotic. The antrum was filled with pus and granulations, the latter being traced as far as the dura of the middle cranial fossa. Small pieces of necrotic bone were found imbedded in the granulating mass. The tympanic cavity also contained pus and broken-down epithelium. The ossicles were missing. Improvement began at once in this man's condition after the operation. By November 13th the cavity had covered over with epithelium, with the exception of a narrow zone at the tegmen antri where granulation tissue was still exuberant. There was still a slight discharge of pus. The granulations were gradually replaced by organized connective-tissue, but it took until January for the ear to become entirely dry. The wound had by that time contracted considerably.

Remarks.—The two features of interest in connection with this case were the presence of the peculiar bodies in the polypus removed from the ear canal, and the reproduction of granulation tissue after the operation and evacuation of pus.

The bodies referred to were most likely fine structureless pieces of bone which, after having been separated from the bone, had grown into the granulating masses.

Case 50.—Chronic mastoiditis. Sinus-phlebitis. Operation. Recovery.

Male, twenty-two years old, has had otorrhœa of the left ear for seven years. On September 2d he had pain behind the left ear and vertex, and in addition on September 3d and 4th he had frequent attacks of vomiting. On September 4th, when he presented himself at this clinic, the mastoid over Bezold's groove was sensitive to pressure, though there was no œdema of the soft parts. There was some offensive pus in the ear canal and some swelling of the posterior superior wall. There was no dizziness and no emesis. The eyes were normal. In the morning the patient had a severe chill followed by a rapid rise in temperature to 39.5°. The afternoon temperature was only 36.6°.

Operation Sept. 5th.—Skin section according to Stacke. Bone operation of Zaufal with secondary plastic. Most of the mastoid was sclerotic; towards the tip it was cancellous, the cells being filled with pus and granulation tissue. The apex of the mastoid was removed, the sinus being exposed posteriorly. In approaching the antrum a sequestrum of bone was removed. The antrum and tympanic cavity were lined with epithelium and granulation tissue. The sinus was bared to its knee, where softened bone was found resting against the sinus.

The sinus appeared discolored grayish red. An exploratory incision brought normal blood. The emissary vein, which was accidentally wounded, discharged blood in an intermittent stream. The temperature, which on the day of the operation rose to 38°, fell rapidly after the operation, the patient making an uneventful recovery. He was discharged cured December 3d.

Remarks.—We felt in this case that the rapid rise in temperature to 39.5° following a chill, and the circumscribed changes in the sinus, justified an exploratory incision into the vein. As the blood withdrawn was perfectly normal, we assume that removal of the necrosed bone about the sinus brought about the relief in this case. The pulsation noticed in the wounded emissary vein was an unusual condition, the significance of which could not be explained.

The next three cases are mentioned only by title, as follows:

Case 51.—Sch. Wenbula, nine years. Chronic mastoiditis. Symptoms of leptomeningitis. Operation for mastoiditis. Death.

Case 52.—K. Else, eight months. Bilateral otitis media purulenta. Symptoms of hydrocephalus: Lumbar puncture. Flakes of pus in the otherwise clear fluid, besides diplo- and streptococcus.

Case 53.—B. Maria, four years. Otitis med. pur. frequently recurring. Symptoms of meningitis. Lumbar puncture. Liquid under high pressure, devoid of cellular elements. Cultures remained sterile. Death.

THE USE OF THE ROTATORY BUR IN THE TREATMENT OF CHRONIC SUPPURATION OF THE MIDDLE EAR.

BY DR. STURM,

ASSISTANT AT THE EAR CLINIC OF ROSTOCK, GERMANY.

Translated by Dr. ADOLPH O. PFINGST, Louisville, Ky.

IN 1894, about a year after the publication of Macewen's *Pyogenic Infective Diseases of the Brain and Spinal Cord*, Professor Körner, at the meeting of the German Otological Society in Bonn, suggested the rotatory bur, so extensively employed by Macewen, as the best instrument to smooth the bony cavity after a radical mastoid operation. The method was adopted by many otologists in Germany and was advocated by Politzer in the last edition of his textbook on otology. It may be stated that the use of the bur is not as harmless as it would appear. This is evidenced by numerous cases of necrosis of the bone surrounding the field of operation, destruction resulting from the heat generated by the rapid rotation. On account of this danger, and from the fact that in the rapidity of healing nothing is gained by having a smooth bony cavity, Körner and other former advocates of the bur in Germany have abandoned its use in dressing the bone in radical operations; although still in use, its indications are limited.

In Körner's clinic it is employed in radical operations only when it becomes necessary to open the vestibule or semicircular canals. However, it is employed in two classes of chronic cases. We use it in cases where pus production is limited to the attic and where removal of the ossicles fails to relieve the otorrhœa. The lateral wall of the attic can readily be removed with the bur, thereby exposing the attic with its contents and enabling the surgeon to control his therapeutic measures within the cavity.

The rotatory bur is also used in those cases where superficial necrotic areas of bone are present on the inner wall or floor of the tympanic cavity. These necrotic areas are particularly frequent about the promontory. They result from various causes—most frequently from the application of caustic therapeutic agents. The bur readily removes the necrosed tissue, the bone soon returning to its normal smooth condition, and pus discharge ceasing. To avoid injury from heat it is well to stop the bur every few seconds, the interval being employed in mopping away blood.

In the last year nine cases have been operated upon with the bur in this clinic. In four of this number the attic was exposed. Two of them were cured rapidly and have remained so until now—a period of three and a half years. The other two discontinued treatment before a cure was effected.

In all of these cases otorrhœa had existed for five years notwithstanding treatment. In the five other cases the bur was employed to remove superficial necrosed areas in the tympanic cavity. One of these cases has now been free from ear trouble for three years, one for nine months, and two for six months. One is still under treatment. Considering the abundance of material at our disposal, it is noticeable that the bur is of service in but a small per cent. of cases. Anatomical conditions must be favorable, *i. e.*, there must be a short, wide ear-canal allowing the use of a bur with a short shank.

The burs used in our clinic vary from a pyriform to a spherical shape and have a diameter of two to three millimetres. Their blades have a slightly spiral course and diminish in size as they approach the pole where they terminate. They have a much slower action at the pole than at the equator. This enables the operator to proceed more cautiously when using the pole, as in the removal of superficial necroses, and to work faster in entering the attic, where the coarser part of the bur comes into play when working laterally.

General anæsthesia can usually be dispensed with when the bur is used for the removal of necrotic areas from the labyrinth wall. However, when the attic is to be opened, general anæsthesia is advisable. In this operation the bur readily penetrates the thin skin of the ear canal, making section of this tissue unnecessary. Bleeding is usually not severe, yet it takes frequent mopping to enable the operator to see distinctly. We use for this purpose gauze saturated in a solution of ferripyrin and cocaine. The field of operation should be well illuminated either with electric or reflected light. At the completion of the operation the cavity is irrigated, a tampon of gauze inserted, and a bandage applied. The only ill effect of the operation so far observed has been tinnitus, which usually subsided in several days.

The following cases would serve to illustrate the possibilities of the operation just described.

A male, twenty-five years old, with a history of otorrhœa on the right side since childhood, applied for treatment January 26, 1901. The ear canal was filled with foul pus. The drum was destroyed, the short process of the malleus alone being visible. Just under it a polypoid mass of granulation tissue was visible. The granulations were removed and an endeavor made with Hartmann's polypus forceps to remove the rest of the malleus. Only a portion of the manubrium and the short process of the malleus were removed. By February 20th, after regular irrigation, the discharge of pus had ceased, and the tympanic cavity, as far as could be seen, was covered with healthy epithelium. In June the otorrhœa returned and continued until October, when the patient again presented himself for treatment. The pus could then be seen exuding from the posterior portion of the recessus epitympanicus. No granulation tissue was visible, and the pus was free of epithelial debris. The patient could hear a whisper at one metre. Sounds from the tuning-fork on the vertex were transmitted to the affected side.

Conditions being favored by an unusually wide and short ear-canal, it was decided to expose the attic by removing its lateral wall with the bur. The operation was performed, November 20th, by Professor Körner, after irrigation of the attic through a curved canula with sterile water, followed by alcohol; the skin and bone were penetrated in the manner previously described. A remnant of the body of the malleus and part of the incus were beautifully exposed and easily removed with forceps. As the attic contained no granulation tissue, and showed no break in the epithelial lining, it was evident that the pus had its origin in the antrum. Consequently it was decided also to enter the antrum with the bur. Two longitudinal sections were made through the soft parts of the ear canal, including the periosteum, one extending the length of the upper wall almost to the concha, the other along the inferior wall posteriorly. This tongue-shaped flap was elevated from the bone and pulled out of the canal and held there by means of artery forceps. Working with the bur through a short wide speculum, entrance was gained into the antrum by removing its anterior and external walls. The antrum was so thoroughly exposed that its most remote crevices could be seen. The cavity was lined with epithelium, but contained three or four small granulating areas on the posterior and median walls. After these were thoroughly removed with a curette, the flap of the membranous canal was replaced and held by a tampon. By December 31st, pus formation had entirely ceased. The function of the ear had been so much improved that a whisper could be heard at seventeen metres. Four months later, a small granulating area again appeared, but after its removal there was no further trouble.

The treatment of this case was facilitated by unusually favorable anatomical relations. It made a complete exposure of the entire middle ear through the auditory canal possible. The same operation could hardly have been performed with chisel and mallet.

The advantages offered the patient through this operation are, that it makes an externally visible wound unnecessary, and the rapidity of its completion thereby shortens the period of narcosis. The entire time consumed, including the anæsthesia and application of bandage, was only twenty-five minutes. It offers advantages to the surgeon in simplifying the after-treatment. By removing the external wall of the attic, the ossicles had so perfectly been exposed that their removal became a much safer and more simple matter than by the methods ordinarily employed. Judging by this case it is evident that in selected cases the exposure of the attic by means of the rotatory bur is not only justifiable, but preferable to the methods ordinarily employed. In the latter, work is done in the dark, and at times considerable traumatism results. Dislocation of the incus into the antrum has also occurred. We realize that the method just described can not replace the present methods of removing the ossicles, but would advocate its use in those selected cases where anatomical relations will justify it.

VERTIGO.

By RUDOLPH PANSE, M.D., Dresden.

Translated by Dr. Arnold Knapp.

VERTIGO or, more properly speaking, vertigo of position is an erroneous conception of our relation in space. Normally we know whether we are lying down, standing upright, bent over, or are sitting down; whether we are moving forward, backward, sideways, up or down; whether we are stooping or whether we are turning, with head erect or bent over. The erroneous impressions of these positions, that is, sensations of vertigo, are expressed by changes in our bodily position, and although standing quietly and straight we may think we are bending over or inclined to one side, that we are sitting down or lying down, we may believe we are being moved in a vertical, horizontal, or lateral direction, or that we are moving in a quite indefinite manner. On the other hand, we may refer our sensations to our surroundings and it appears as if the surrounding space were moving forward or backward, that it is coming toward us or that it is turned in a certain direction; for instance, that the entire space is rotating about us vertically, or that the upper part is turned to the right or to the left or appears to incline toward or away from us. Finally, certain indefinite movements are perceived whose direction we cannot define.

The impression of our bodily relation in space is conveyed along three paths: by the eyes, through the organs of equilibrium in the labyrinth of the ear, and by the kinæsthetic sense—that is, the sensation of the skin, muscles, joints, and viscera. Centripetal stimuli pass along these three paths which unconsciously enable us to preserve the equilibrium of the body. Along each one of these paths morbid stimuli may pass which, if they are sufficiently strong, will lead to a disturbed conception of our position in space—in other words, to vertigo.

I. First, in regard to the eyes. When we fix a definite object with our eyes, we increase the convexity of the lens by the action of the ciliary muscle in order to obtain a definite picture on the retina. We are able to estimate the distance between the fixed object and our body by the necessary impulse to innervate this muscular activity. This activity suffices to judge of the distance when seeing with one eye alone. When both eyes are used, a second muscular activity comes into play, namely, the convergence of the ocular axes, which also enables us to estimate the distance of the object. If by a morbid stimulus the pupil is contracted or dilated or the ocular axes converged, a false, even though unconscious, impression of distance or approach of space arises with ocular vertigo and nausea, unless this impression is corrected by other means.

Vertigo can be produced by placing a convex, concave, or cylindrical glass before healthy eyes, whereby exact fixation is prevented; also and still more so by the use of a prism, which, notwithstanding the uniform impulse to both sides, produces indistinct or double vision. This same condition occurs in ocular paralyses.

Cyon placed a prismatic glass before the eye of a dove. The animal could not fly, its movements were very shaky, and it fell at every step. Other doves showed peculiar pendulum-like movements of the head.

If the object to be regarded is situated laterally from the visual line the eyes must be turned in that direction. We judge of its position by the degree of ocular movement which in turn is determined by the amount of innervation supplied to the muscles. This estimation takes place through nervous processes of which we are unconscious. If the ocular muscle should be weakened, the necessarily increased innervation for its movement gives the impression of a greater excursion, and consequently the object which is looked at appears to be situated more to the side than it really is; if the patient attempts to touch the object, his hand will pass to one side of it. His arm moves in conjunction with the innervation of the weakened muscle too far in the direction of the activity of this muscle, just as the other eye moves too far in this secondarily deviated position. The false projection of the visual field causes disunion between this and other sensations which serve as guides. The result of this disunion is the sensation which we call vertigo (ocular or visual vertigo). The nervous centres after a time can alter their activity so that the false projection with its consecutive vertigo ceases to annoy the patient. The patient may attempt to avoid diplopia by turning his head, whereby the action of the affected muscle is not called into play, or by closing the diseased eye.

Mendel writes: "One of the first symptoms of ocular paralysis is vertigo. It need not be permanent, as the central parts adapt themselves to the changed conditions. Patients with double seeing are able to correct this. All, however, do not do this, because at the moment of correction vertigo sets in. Stewert reports a case of a patient suffering from severe nystagmus who had violent attacks of vertigo. Pressure on the eyes sufficed to bring the vertigo to an immediate cessation. This shows that not only the peripheric but also the nuclear ocular muscle paralysis may give rise to vertigo. In some cases vertigo is a symptom which precedes the paralysis."

If the object observed moves away from the visual line, the eye must follow it according as its motility permits, and the head and body aid. If the head is held fast, the eyes may follow the moving object only to a certain point. Should the motion remain in the same direction for some time and rather slow—for instance, in the vertical plane,—the eyes will follow the object observed with the same rapidity up to the terminal positions of the ocular muscles and then return rapidly to the primary position without giving any visual impression, and from here again the original movement will be followed. The movements occur involuntarily.

The same course is pursued if the visual field remains stationary and the head or body is turned. In one rotation about ten spasmodic movements take place, which cease after several rotations. The same holds good for anteroposterior rotations. If the head is bent forward and rotations occur in the frontal plane of the head about the vertical axis, compensating ocular movements set in like those of rotatory nystagmus in 20° of deviation from the original direction. If the turning occurs with a certain rapidity, the eye will remain stationary in a strained position and indistinct visual impressions will be produced. Points appear as lines and lines as surfaces; the eyes no longer are able to instruct us in regard to the surrounding space and our relation to it.

The same indistinct visual impressions occur in rapid rectilinear progression of our body—in other words, horizontally, as in the steam cars, vertically in elevators or in rapid movements of the visual field, or a part of the same as a rapidly flowing stream or water-fall. If our attention is so taken up by these movements that they influence our ideas about the surroundings and these in turn are not corrected by our other senses, ocular vertigo occurs, but is absent when the impressions are corrected voluntarily or are neglected.

If these movements of the eyes are caused without associated movements of the body or of the visual field — as by stimuli produced in the body — they are called nystagmus. The ocular movements in this case are projected externally and lead to the impression that space is moved in the opposite direction to the ocular movements.

If we regard with moving eyes an object remaining stationary in the visual field, it will appear to move in the same direction (Gowers). If the reflex stimulus from the labyrinth is so weak that it only causes a feeling of motion, then the surrounding space appears to move in the same direction. Should it, however, be so marked as to really produce nystagmus, then the stationary position of space appears to move past the slow ocular movements and a sensation of apparent movement in the opposite direction to the visual field is perceived.

Ocular vertigo, according to Mach, is as follows: It appears as if the visual space rotates in a secondary space which we consider immovable, although the latter is not visible. One would think that behind the visual space there is another space to which the first is always referred.

In order to examine ocular vertigo this author experimented as follows: The person to be examined sits upon a beam which is rotated horizontally. The patient is covered up by a paper box. In this rotating apparatus a paper drum, on the end of a vertical pole, is brought near the head of the observer. If this is brought to rotate for a few minutes, one believes that the objects not covered by the drum rotate in the opposite direction. Thus, again, one believes that the drum is rotating while the patient himself is quiet, but both subjective conditions often change.

If the rotating apparatus is brought into motion, the drum does not move. If the apparatus is then suddenly stopped, the drum will move slightly, and the observer will regard the moving drum as stationary, but thinks that he is being turned most rapidly in the opposite direction.

Bechterew, to show that the direction of the ocular axis has a most important influence on the visual organ of equilibrium, cites the observation that walking with the eyes strongly deviated to one side is sufficient to make one quite unsteady, and that the body will deviate to the opposite side. If we stand on one leg with closed eyes and then move the eyes rapidly in a certain direction, there will be an involuntary tendency of the body to go in the opposite direction and we are liable to fall unless the eyes are opened at the right moment. This same author believes that sight is of service to the atactic in walking, because it enables them to find a definite fixed point for the ocular axes rather than to control their movements, and thinks that the organ of equilibrium contained in the central gray matter is influenced by the mechanical disturbance of the lamina cinerea and the ventricular fluid by the movements of the optic nerve in movements of the eyeball.

No vertigo is caused by the typical chronic nystagmus of persons with diseased eyes. The importance from the standpoint of differential diagnosis leads me to consider this more closely.

Nystagmus is a peculiar movement which, as a rule, attacks both eyes and is associated. If the movement is, as is usual, from right to left, or from above downward—a diagonal direction is unusual — the nystagmus is called oscillatory; if, however, the eyes move as if rotating about the visual axis, rotatory. Simultaneous movements of the head are sometimes made.

Nystagmus occurs in individuals who have been weak-sighted since childhood, and usually the degree of poor vision varies in the two eyes, though in individuals with perfect vision we occasionally observe nystagmus existing since childhood. A disturbance in the localization of the objects observed is not present, notwithstanding the constant ocular movements. Frequently in addition to nystagmus there is convergent strabismus. There may be a certain position of the eyes where they will be more quiet, while in other directions increased activity of motion results. Emotional excitement increases the vibrations. They occasionally diminish with age. Transitory vibrations are sometimes observed in predisposed eyes during inflammatory affections, if they are suddenly exposed to light, after irritation of the fifth nerve, etc.

The cause of nystagmus is supposed to be disturbance of innervation. It hardly seems possible to believe that it occurs in the interest of improved vision by projecting an object upon different parts of the retina. On the other hand, its presence in good-seeing eyes and its absence in a number of equally weak eyes, together with a variety of forms of motion, also speak against this.

For most cases Wilbrand's explanation, with a certain modification, seems to be more fitting. This depends upon the view that the centres in the mid-brain and cerebellum, which reflexly influence the ocular movements, are unusually active as opposed to the visual centres and the voluntary moving centres in the cerebrum. If the latter are secondary on account of primary or reflex irritations which pass from the cutaneous nerves and sensitive fibres of the trigeminus to the semicircular canals of the ear, to the cerebellum and the mid-brain, nystagmic movements result. In order to produce typical nystagmus it is, however, necessary to have the effort of seeing. In addition, we find that true nystagmus always is wanting in people who become blind in later years, and we find it absent in individuals who have been completely blind in youth. These, however, frequently show involuntary associated ocular movements which may be directed to the right, left, or down; but the true nystagmic contraction is absent.

According to Schmidt-Rimpler, the conjoined action of the effort to see plays a most important role in these nystagmic convulsions. By this, the involuntary movements which result from the preponderance of the reflex centres are interrupted in the interest of seeing by the voluntary efforts at fixation. This produces an antagonism between these two influences.

That the effort of seeing is not associated with nystagmic-like movements is also evident when we consider that they occur if movements of the head with closed eyes are executed.

The occurrence of nystagmus in the most varying intracranial diseases, pachymeningitis, sinus thrombosis, disseminate sclerosis, hereditary ataxia, and cerebro-spinal meningitis, shows that the point of irritation may be situated in one of many points in the reflex arc of ocular movements. An exact knowledge of its course is, therefore, essential.

The ciliary muscle is innervated by the third nerve. This same nerve supplies the muscles which move the eyeball, except the superior oblique, which is supplied by the fourth, and the external rectus, which is supplied by the sixth. These three motor nerves are stimulated, under ordinary circumstances: (1) voluntarily through the cerebral cortex; (2) involuntarily, subcortical, in unconsciousness, by stimuli which proceed from the optic nerve and co-ordinate from the opposite side. The voluntary stimulation of the oculomotor nerve takes place along this path. The central neuron fibres arise in the cerebral cortex. They make their way through the knee of the internal capsule with the general pyramidal tract and leave the latter in the cerebral peduncle. They pass directly to the oculomotor nucleus underneath the central gray matter of the aqueduct of Sylvius in the region of the anterior quadrigeminal bodies, where they decussate in the middle line, after which they terminate in their final filaments. The nerve fibres arising from the nucleus pass first in the oculomotor nerve along the upper wall of the cavernous sinus, through the superior orbital fissure to the muscles about the eyeball.

According to Bechterew, the third nerve arises from several nuclei in the level of the anterior quadrigeminal bodies; two larger, one paired and one unpaired, and two smaller accessory pairs. The former contain the main nucleus below the anterior quadrigeminal bodies on both sides of the middle line. It is crescentic on transverse section. Laterally and ventrally it is in relation with the posterior longitudinal bundle. In the level of the middle and anterior thirds, between both principal nuclei, there are a medial unpaired nucleus and dorso-laterally the small oculomotor nuclei. The fibres for the pupil and accommodation are situated more anteriorly, and arise from the so-called anterior-superior nucleus. The posterior subdivide into a lateral group for the levator palpebræ, the superior rectus, and inferior oblique, and a median group for the internal and inferior recti.

The trochlear nerve arises in the cortex. Its central neuron passes to the knee of the internal capsule, decussates in the anterior medullary velum, and reaches the opposite trochlear nucleus, partly medially and partly dorsally to the posterior longitudinal bundle below the posterior quadrigeminal bodies behind the oculomotorius nucleus, with which the fourth nucleus appears to be connected. The trochlear nerve arising from behind the quadrigeminal bodies decussates with the one of the opposite side, passes along the ventral side, and supplies the superior oblique.

The abducent nerve passes from the cerebral cortex, decussates in the abducent nucleus, adjoins the middle line in the knee of the facial fibres below the fourth ventricle, and splits up. Then describing a slight arch, the sixth nerve—as its peripheric neuron—leaves the brain through the posterior part of the pons between the latter and the medulla oblongata. In the cavernous sinus it is first situated above and then to the outer side of the carotid, passes through the superior orbital fissure, and joins the external rectus muscle.

Irritation of the posterior wall of the third ventricle causes accommodation, then contraction of the iris. Irritation of the transitional portion between the aqueductus Sylvii and the third ventricle produces contraction of the internal rectus. Irritation of the floor, starting anteriorly and passing backward, produces contraction of the following muscles in order: superior rectus, levator palpebræ, inferior rectus, inferior oblique.

The sixth nerve especially, of all the ocular nerves, is in relation, through a particular bundle of the fibres, with the upper olive. The nuclei of all the oculomotor nerves are connected by parts of the posterior longitudinal bundle whose posterior fibres pass to the spinal cord.

The importance of the tracts which connect the nuclei of the oculomotor nerves with the gray anterior horns of the spinal cord is probably found in the association of ocular movements with movement of the extremities.

The peripheric fibres of the optic nerve which arise in the ganglion cells of the outer and middle retinal layers find their terminal distribution in the retina. The neurons, however, situated in the internal layers, combine after leaving the retina and pass through the optic foramen to the optic tract in the chiasm, and there partly decussate. The fibres of the two optic nerves pass, for a longer or shorter space, in each optic tract to the cortex. The fibres of the long tract pass from the optic tract to the lateral geniculate body, surround this, and pass through the posterior third of the posterior arm of the internal capsule to the occipital lobe (calcarine fissure). The greater mass of the short tracts proceed to the primary optic centres—namely, the quadrigeminal bodies, the external geniculate body, and the pulvinar thalami, and there break up into cells of the third neuron. After this interruption they join the fibres of the optic radiation and pass through the posterior arm of the internal capsule to the cortex of the occipital lobe.

There is a collateral reflex from the optic centre in the corpora quadrigemini to the oculomotor nucleus.

Bechterew gives a somewhat different description as follows: The entire optic tract contains two functionally connected neurons. The anterior is formed by the large ganglion cells of the retina and from the fibres which originate in it. The latter are directed backward; they become components of the optic nerve and the chiasm and of the optic tract and break up into the ganglia of the inter- and mid-brains. The posterior neuron is represented by cells and neurites in these ganglia which distally enter in the occipital optic tract and reach the cortex of the occipital lobe in the neighborhood of the calcarine fissure.

The bundles of the optic nerve are sharply defined up to the region of the external geniculate body. At this point the coarser fibres partly enter into the formation of the capsule of the geniculate ganglion, and partly form the medullary lamina.

In man the external geniculate body is the most important optic centre, although delicate optic-nerve fibres also enter into the thalamus and the anterior quadrigeminal body. The latter were regarded by Gudden as pupillary reflex fibres. The anterior quadrigeminal bodies transmit light stimulus to the ocular muscles and to the motor sphere. These pupillary fibres after a partial decussation in the chiasm, continue for a distance in the tract, but at a point between the tuber cinereum and the oculomotor nerve, directly in front of the external geniculate body, they deviate toward the median line and then again, probably after a partial decussation, pass through the posterior segment of the thalamus and the posterior commissure to attain their centre, namely, one of the oculomotor nuclei. Behind the chiasm some fibres of the optic tract pass directly to the gray matter of the third ventricle. Perhaps optical impulses are transmitted along this way to the organ of equilibrium, near the third ventricle.

Bechterew was able to show that lesions of the third ventricle change the motility in the same manner as lesions of the semicircular canals and of the cerebellum. In both instances the loss of bodily equilibrium is the immediate result, together with the onset of different forced movements and nystagmic symptoms. At the same time his experiment has shown that lesions and nerve sections in the course of the tracts passing from the above-mentioned points to the cerebellum produce this symptom complex.

It seems probable that the cerebellum receives centripetal impulses from these systems. There can be no doubt that there are independent centrifugal paths to the cerebellum, as removal of the parts of the brain situated proximally to the cerebellum, with the exception of the third ventricle and its neighboring gray masses, causes no interference with the normal bodily equilibrium.

As Bechterew has shown the presence of pupillary fibres which run in the optic nerve centrally from the tuber cinereum and that lesions of the third ventricle cause characteristic changes of the light reaction of both pupils, it seems probable that disturbances of the equilibrium depending upon a lesion of the third ventricle must be referred to a lesion of the optic-nerve fibres.

The peculiar blood supply of the oculomotor nerve nuclei is, according to Mendel, a likely cause for the production of ocular vertigo. He believes that every disturbance occurring in the central nervous system influences the ocular-muscle apparatus, as being a small and non-resisting portion. It is clear that this must have its cause principally in the circulatory apparatus.

Examinations of the relation of the blood supply to the ocular muscles give the following results. The nuclei of the ocular muscles are supplied by small delicate arteries which are branches of the posterior cerebral artery. These arteries are end arteries. They have no communicating branches nor communicate with the vascular system of the lateral parts. In addition to this peculiar condition, these arteries change from a horizontal to a vertical course. Another point of importance is this—the nuclei of the third and fourth nerves are situated below the cerebellum and both are supplied by small arteries derived from the basilar or the vertebral artery. These small blood-vessels originate at the place where the current of the carotid joins that of the vertebral, causing interference with the currents and a retardation of the blood flow. Hence there is no part of the brain which is so poorly supplied as the nuclei of the ocular muscles in regard to blood supply, and from this fact it is apparent that every circulatory disturbance has full effect on the ocular muscles.

In anæmia of the brain following severe loss of blood, the first symptom is a blurring of the vision and vertigo. Similarly the circulation is altered when the cerebral vessels encounter changed physical conditions. If a weak person suddenly sits up in bed, the circulation becomes disturbed and the patient experiences vertigo.

II. The second nerve path by which we are instructed as regards the relation of our bodies in space is the vestibular branch of the eighth nerve. The terminal fibres end in the saccule of the vestibule and the semicircular canals as a thick-meshed structure surrounding the hair cells. These, supported by flask-shaped epithelial cells, are so arranged that their hairs project freely into the endolymphatic cavity. A cellular mass, which coagulates in the usual fluids of investigation, rests upon these cells, and at the region of the macula utriculi and sacculi (and in the lower animals at the lagena) contains crystals of lime (otoconia, otoliths), which in certain fishes are stones of one centimetre in size. Changes in the position of the head cause pressure on and dislocation of these crystals; the nerves of the two end stations are thereby stimulated and sensation in regard to the position of the head is produced. The long axis of the macula utriculi is directed from in front, up and in, backward, down and out. The diameter is about horizontal. The long diameter of the saccule is almost vertical, or, more properly, up and in to down and out. The lateral axis is antero-posterior. At its median wall there is the macula.

According to Adler, it is possible to distinguish a deflection forward or lateral of the head from that of the entire body by the lime plates of the sacculus and utriculus.

The gelatinous substance on the maculæ of the three ampullæ projects directly into the cavity and produces an obstruction to the passage of the endolymph in these canals. This current is produced by the fact that the fluid, owing to its heavy consistency, does not directly follow the movements of the bony canal and of the head and is consequently displaced and pushed to the wall. This has the result that the gelatinous cupola and the hairs of the neural epithelium are elevated and the nerves which surround the hair cells are stimulated and the sensation of movement is perceived.

If the movement of the head and of the semicircular canals continues somewhat longer, the power of inertness in this fluid is overcome by the adhesion to the walls and the fluid gradually assumes the same velocity of rotation, then we experience no rotation. Should all movement be suddenly arrested, the endolymph continues in its motion and forces the cupola and its hairs in the opposite direction. A sensation opposite to the original rotation is brought about although nothing of the kind is present. We are in error in regard to our relation in space and vertigo (labyrinthine) is produced.

To produce movement of the endolymph it is necessary that the head be moved in the plane of the canals.

We are instructed by the three different planes of the semicircular canals, of which there is always one on the right and one on the left side which are parallel, in regard to motions in three different directions.

Ewald, who has made the most extensive studies of the terminal organ of the eighth nerve, assumes the presence of a constant influence of the muscular apparatus of the body through the labyrinth of the same side, and has produced with stimulation by the anode and kathode (as well as by different currents in the membranous canals) an irritation reaction and a weaker retardation reaction. With the aid of a very delicate pneumatic hammer, he has shown that when pressure is exerted on the external semicircular canal of the dove when the ampullary end is closed off and the current is forced to the ampulla, a stimulus is experienced which turns the head to the opposite side; on retraction of the hammer, a weaker retardation by motions of the lymph current from the ampulla in the canal. The retardation of the hammer causes an irritation in the anterior and posterior canals of the dove by forcing the current from the ampulla into the canal, and a retardation by forcing the current from the canal to the ampulla. All movements take place exactly in the plane of the semicircular canal.

Dreyfuss also assumes the presence of a labyrinthine tone. He experimented carefully in guinea-pigs and makes a distinction between the symptoms which follow the removal of one labyrinth in the first day and permanent ones. In the first hours, the head is turned toward the side of the missing labyrinth; nystagmus of the head toward the healthy side; eyes deviate toward the missing labyrinth; ocular nystagmus toward the healthy side; deviations and rotations to the side without the labyrinth. This ceases later on and the rotations only take place on movement.

In rotations to the healthy side, animals which have been operated on some time ago appear like healthy animals, but exhibit the concavity of the trunk toward the affected side, nystagmus of the head and eyes to the healthy side. In the opposite direction there is no concavity of the trunk on rotation but nystagmus of the head and eyes to the affected side, probably the result of simultaneous innervation of the muscles originating in both labyrinths. Horizontal rotation stimulates the labyrinth in the direction toward which it is directed and retards the other.

Flourens found that section of the left horizontal canal in the rabbit causes holding of the head to the left side after the violent movements to both sides have ceased.

I have been able to more exactly study the kind of nystagmus in two cases of operative injury to the descending part of the bony external semicircular canal, and in a case of large carious fistula in the ampullary extremity of this canal. Pressure on the probably intact membranous canal produced spasmodic movement of the eyeball to the side of the healthy labyrinth, and on violent pressure the eye would remain stationary in the corner nearest the healthy labyrinth. This movement took place together with movement of the head toward the healthy ear, and several times produced movement of the head. As in the latter the lymph current has been forced into the ampulla, we may say that pressure on the canal has forced this current toward the end freed of its ampulla, or that every movement of the lymph of the horizontal canal brings about this same result—namely, the impression of rotation of the head toward the other ear. Other observations contradict this view, so that we cannot, from the described apparent movements and the movements of the eyes and head which have been observed, draw any conclusions as to the site of the disease. Examination of cases with labyrinthine necrosis on the rotating board may furnish important aid.

The only published observations of sequestrum of both labyrinths in man which are reported, by Gruber and Max, showed no muscular weakness, and consequently do not speak for the presence of a tonus originating in the labyrinth for man. The otological journals present but very few carefully examined cases in regard to the kind of vertigo.

After the above description of the ocular movements in a circulating visual field, we must assume that the rapid contractions are directed against the apparent movement and that the sensation of rotation is opposed to the apparent movement of the visual field ; in other words, directed in the same way as the contractions. The true turning is a combined factor and will be described later.

Lucae has observed in cases of perforation of the drum and rarefaction of the air in the auditory canal, vertigo with apparent movement of the visual field — in affection of the right ear, from right to left; in left-ear affection, from left to right. The eyeball would be turned away from the irritated side and crossed diplopia ensued. The patient claimed that in experiments on his right ear the objects divided and a second indistinct picture was turned to the side. Another case presented the same apparent deviation. In a third, irritation of the left ear produced a subjective movement of the patient himself from right to left. In all cases the vertigo ceased on closure of the eyes. Lucae excludes any connection between the labyrinth and vertigo.

Jansen believes that spasmodic contractions following an injury to the semicircular canals always, or at least generally tend toward the healthy ear, corresponding to the apparent rotation of the patient toward the healthy side. Sometimes the spasmodic contractions appeared on looking straight forward, or seemed, while they were frequent and well marked on looking to the healthy side, to be slow, superficial, and mild on looking to the diseased side.

Jacobson has described two cases of labyrinthine disease in which the patient noticed an oscillating movement of objects; in another patient with right-sided aural affection, he seemed to observe objects turning in a circle from left to right. Another patient became dizzy when a very loud c^4 tuning-fork was struck and held near the right ear, and objects appeared to turn from left to right, the patient himself believing that he was going to fall forward.

Nystagmus-like movements in sinus thrombosis are almost always of the same kind — namely, lateral and synchronous, horizontal and slightly rotated, or oscillatory, the movements being in the form of short or — on fixing — long and extensive contractions. These contractions usually followed looking toward the side opposed to the diseased ear. They would come on frequently immediately after passing the middle line, they would increase up to the extreme limit of the field, while turning the eyes to the extreme limit of the field on the aurally affected side would cause them to be perfectly quiet or show only oscillating movements.

Kipp observed a patient with left-sided suppuration who noticed that the objects appeared to move from left to right when he experienced vertigo; in addition there was nystagmus and crossed diplopia. On irrigating a suppurating left ear the pupils became dilated, the eyes moved at first slightly to the left then more strongly to the right, the movements being equally rapid in both directions and of the same extent.

In a case of right-sided suppuration, pressure on the mastoid process produced movement of the eyes usually to the left, then more rapidly and more extensively to the right; no movement of the visual fields, but the head seemed to turn. In the case of Jackson, pressure on the right tragus produced lateral movements of the eyes and movements of the visual field from right to left; the return was not observed. This was associated with a sensation of falling to the left. Later on ocular movements were observed which were at first slow from left to right, then more rapidly to the right; the greatest excursion was noticed when an object was looked at above the head, the weakest, on looking at something near and below.

According to v. Stein, the disturbances of equilibrium in ear disease are characterized by the following points:

1. The disturbance is present with closed eyes in the absence of ataxia or paræsthesia.
2. With open eyes the rapid movements never reach their normal promptness or correctness and are usually hesitating and slow.
3. The disturbances are present in certain positions and in certain directions.
4. They are not equally distributed to both lower extremities; for instance, the patient can stand on the right leg but not on the left.
5. The disturbances of movement are polymorphous.
6. Rapid fatigue on motion, especially with closed eyes. A part of the so-called muscular sense is probably nothing else than unconscious sensation which continually emanates from the labyrinth to the muscles.
7. The reaction on the goniometer, the level of which is gradually made oblique.
8. Simultaneously existing diminished hearing and other aural troubles.
9. Tinnitus without diminished hearing.
10. Nasal affections.
11. Attacks of vertigo following lesions of the nerves or of the eyes.
12. On falling, the patient remains perfectly conscious though he may be at times slightly dazed.

Beside its terminal portion in the labyrinth, the vestibular nerve may become stimulated in the rest of its course. The median, anterior, vestibular roots of the eighth nerve arise in the area of the ampullæ from cells whose peripheric processes enter into the epithelium of the macula and crista acoustica, and enter into relationship with the following nuclei in the medulla oblongata: first of all with the large-celled lateral or Deiter's nucleus, then with the nucleus described by Bechterew,—namely, the nucleus of the vestibular nerve at the lateral angle of the fourth ventricle, composed of small nerve cells,— and, most probably, with the so-called median nucleus. After entering into Deiter's nucleus, a part of the root diverges and passes within the nucleus for a distance, and gradually terminates in the form of the so-called ascending acoustic root which distally becomes lost in the region of the upper end of Burdach's nucleus.

Deiter's and Bechterew's nuclei are in connection with the central nuclei of the cerebellum, especially with the nucleus globosus and emboliformis. A number of fibres pass through the Deiter's nucleus to the abducent nucleus, others through the nucleus medialis in the depths of the formatio reticularis to the nucleus lateralis, to the motor vagus nucleus, consequently reflex vomiting; still others pass from the nucleus of Deiter along the lateral column of the cord. The entire floor and the lateral wall of the fourth ventricle can be regarded as the primary terminal station of the vestibular nerve. The median portion of the restiform body contains the descending branches of the vestibular nerve.

A (medial) tract passes from Deiter's nucleus anteriorly about the facial knee, traverses the abducent nucleus or passes behind this and finally enters the posterior long bundle, after dividing into ascending and descending branches. At the point of turning, collaterals are given off to the abducent nucleus.

Fibres pass from the vestibular nucleus of Bechterew along the median area of the posterior cerebellar peduncle to the cerebellum. To the upper side of these, passing partly between the elements of the anterior cerebellar peduncles, they approach the nucleus globosus and fastigii and apparently also the cortex of the corresponding half of the upper worm. Deiter's nucleus also sends fibres accompanying those of the vestibular nucleus in the median portion of the posterior peduncle to the cerebellum.

The other tracts are found in the anterior cerebellar peduncle which decussate underneath the quadrigeminal plate, and after passing through the red nucleus and optic thalamus attain the cortex of the parietal and central convolutions. Fibres from the vestibular nucleus of Bechterew pass to the posterior long fasciculus of the opposite side to reach the area of the oculomotor nerve.

Karl Biehl divided the vestibular nerve within the cranial cavity. In the sheep, the vestibular and cochlear nerves travel entirely separated from their origin. In the horse, they are connected only by a thin anastomosis. Of twenty-four horses which had been operated on, Biehl succeeded in keeping only one alive for seven days. Immediately after the narcosis, rather awkward rolling movements set in. The animal endeavored to turn itself always so that it lay on the side operated upon. This effort was associated with violent nystagmus. If the animal recovered sufficiently to permit it to stand up, it would stand with legs outstretched, wavering, and was easily knocked over by a slight force from the healthy side. The head was held somewhat crooked, the operated side looked upward, and the head constantly made pendulum-like movements in the sagittal plane.

In the sheep, on touching the vestibular nerve, definite nystagmus and the symptoms of rolling are apparent. After division of this nerve, the head was immediately turned back so that the cheek of the operated side was flat against the shoulder. To this was added very marked nystagmus. The eyeball of the operated side was forced out and down, while the one on the healthy side was up and in. If the animal was placed on the ground, a rolling movement of the entire body about its long axis set in, in the direction of the injured side. If it lay on its side, it would remain quiet. The extremities of the healthy side were lengthened while those of the operated side were half flexed and easily movable. By lying on its back, the difference between the two sides was less apparent. The manége movements which appeared later, according to Biehl, were the result of the removal of the occipital lobe, made necessary in performing the operation which led to the half-sided visual disturbance.

While in this case section of the vestibular nerve resulted in rolling movements toward the injured side, a number of observers, including myself, have noted in man, on irritating the semicircular canals, rotatory movements toward the healthy side. Luciani has observed a similar phenomenon after removal of half of the cerebellum. This can be explained by the assumption that Biehl's section caused paralysis of the vestibular nerve, and that the opposite side preponderated, as is evident from the increased tension of the muscles of the healthy side.

Adler assumes the existence of an apparatus of equilibrium whose centripetal arm is the vestibular nerve, whose centre is furnished by Deiter's nucleus, and whose centrifugal arm is the connection of Deiter's nucleus with the oculomotor nucleus and the anterior horns of the cord. This usually acts below the threshold of consciousness.

This nervous tract is the one recently described by Hoesel —namely, fibres passing between Deiter's nucleus and the nucleus globosus and embolus of the cerebellum of the opposite side, which has also been described by Bechterew.

Ewald writes that it may be said that the non-acoustic functions of the labyrinth have nothing at all to do with the cerebrum. Animals without a cerebrum react in general to passive rotations as well as normal animals and, under certain conditions, better. In another place Ewald writes that the functions of the cerebellum, in a similar way as the eyes and the cerebrum, serve as congenital substitutes for the labyrinth, consequently the central parts for the non-acoustic eighth-nerve functions must therefore be sought in the head marrow. In any case we must, as my experiments have shown concerning the relations between the labyrinth and the muscular system, assume the presence of numerous connections with all muscles.

Gowers mentions, in addition to the frequent vomiting in aural vertigo as a proof of the intimate connection of the pneumogastric with the eighth nerve, the case of a patient who experienced rotatory vertigo after inhalation of tobacco smoke. He is convinced that in most cases in which vertigo appears to be produced in a definite uniform manner from gastric disturbance a careful examination would reveal the presence of auditory defect.

The anatomical proof of this connection is to be found in the fibres which pass from Deiter's nucleus to the motor vagus nucleus.

Bilateral absence of the labyrinth produces, when the eyes are closed, almost the same symptoms as tabes. There are two cases of sequestration of both labyrinths reported in aural literature. The first, mentioned by Gruber in the report of his clinic in 1863, was that of a boy twelve years old. No mention is made of vertigo. The patient lived and apparently is well. The second case was reported by Max.[1] The kind of vertigo present is described as follows: At the moment when also the other side was affected the symptoms of defect became marked to such a degree at first that the patient was not able to make the slightest movement without running danger of falling to the right or left side. Gradually the disturbance of equilibrium diminished without disappearing entirely, as usual; a turning of the head, a rapid walk, or bending over, moreover walking in a street at dusk, were sufficient to produce attacks of vertigo. In fact, the attacks would sometimes appear without any external cause.

Observations on deaf-mutes should be mentioned at this point where, with great probability, the lesion of the vestibule can be taken for granted.

Kreidl observed the following in deaf-mutes: About 50 per cent. of all deaf-mutes show no ocular movements when placed on a horizontally rotating board. Of 63 deaf-mutes, 13 during rotation indicated by a pointer the vertical plane more or less vertically. Consequently they did not make the mistake of healthy people in regard to the direction of the vertical. A certain number were unable to stand with closed eyes on one leg or walk without staggering.

Ewald's doves, in which both labyrinths had been removed, had lost the sense of position of the head. If a cap was drawn over their eyes, the head sank from its own weight down, and the muscular sense then furnished no clue, and was insufficient to correct the false position.

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[1] *Wiener med. Woch.*, 1891, Nos. 48–51.

III. *The Kinæsthetic Sense.*—The third sense tract by which we are instructed as regards our position in space transmits the kinæsthetic sense of the muscles, joints, and skin to the central organs. In any position of the body except the relaxed horizontal position, an exact determination of the opposing acting muscular activities is necessary, and even more so in moving in a straight line, in rotations of the body, in turnings and bendings of the trunk on stationary legs. The degree of the herewith necessary innervating impulse instructs us about the position of our body and of its parts. To a much less degree this is answered by the changed pressure in the vessels and of the blood in the various bodily positions.

Mach has attempted to show that the cutaneous impressions cannot lead to a false sensation of movement. The bare soles of the feet, after being made air-tight with lime, were fitted into two holes in the top of a box; the air in the box was then rarefied. There was experienced a severe pressure on the soles of the feet, and it seemed as if the floor below the feet were going to rise up. The sensation, however, that the entire body was being pushed up—which is of course relevant—was absent.

According to my mind, a sensation of movement is simulated, and we are in error in regard to the direction of the movement, as is often the case, even in actual movements.

The muscular sense as the source of knowledge of our bodily movements has also been examined by Mach. Deceptions by the muscular sense under ordinary circumstances are rare. Bechterew cites the experiment of Vierordt, who observed in man an increase of the normal swaying of the body on standing with closed eyes if the soles of the feet had been artificially anæsthetized, and emphasizes the statement that Romberg's symptom has nothing in common with true ataxia, if one understands the latter to be a disturbance of co-ordination of single movements. Morbid misconceptions are frequent if those tracts in the cord are disturbed along which muscular sense is transmitted to the central organ. As reflex collaterals are given off from these tracts in the various levels of the spinal cord to the motor nerves, we are consequently able to diagnosticate the site of the disease by means of these reflexes.

The muscular sense may be disturbed by disease of the sensory peripheral nerves, and the co-ordination, or regular combined action of certain muscular groups, in a uniform function, may also be interfered with. In this peripheric sensory form of ataxia the centripetal influences reach the intact co-ordinating apparatus in an insufficient degree and regulation of the innervation of the motor fibres suffers.

According to Leube, the disturbance of co-ordination can be explained as follows: Every nerve of an extremity contains fibres from several spinal roots. In each root are collected probably the fibres for those muscles which are usually associated and co-ordinated and correspond to the synergic nerve fibres, and they also contain the ganglion cell groups of the gray spinal marrow. To these motor group areas, without doubt, sensory influences are received through collaterals which originate from the sensory root fibres, partly from the sensory fibres ascending in the antero-lateral root zone and from the cerebellar lateral tract bundle. These centripetal impulses, supplied by the sensory nerves of the skin, muscles, tendons, and joints to the motor ganglion cells, must exert a retarding (inhibiting) influence on the centrifugal motor stimuli in the pyramidal columns.

The centripetal co-ordination tract (Clark's columns) and the cerebellar lateral tract can be followed into the cerebellum. We must assume that in the posterior central part of the cerebellum there is a collecting place for the centripetal influences which are transferred to motor tracts. The preservation of the bodily equilibrium demands the conjoined activity of numerous muscles. To ensure a sufficient co-ordination, the various sensory impulses and the activity of its regulating influences must be exerted upon a greater number of motor tracts. This is only possible above the spinal cord.

These centripetal tracts are the following: The fibres from the cells of the spinal ganglia and cell bodies of the various sensory peripheric neurons are collected together in the posterior roots. They divide into two parts; the larger one passes medially in the posterior columns, the smaller passes laterally in the posterior horns. The latter divide in a T-shape manner into ascending and descending branches, which after a short course turn at right angles and split up about the cells in the posterior horn. The stronger central part of the posterior roots travels in Burdach's columns and divides first into short branches, which again pass at right angles into the posterior horn, into the anterior horn, into the middle zone and Clark's cells, and represent reflex collaterals; secondly, in long branches which pass upward in Burdach's column, at first laterally then medially, collect in Goll's column and enter the fibres of the cervical cord. These long branches finally end in terminal trees in the gray nucleus in the upper extremity of the funiculi graciles and cuneati, from where the sensory central neurons and fibres of the lemniscus originate, which pass to the cerebral cortex, and fibres passing through the lateral portion of the posterior cerebellar peduncle to the cerebellum. An ascending bundle travels in the anterior column to the inner side of the pyramidal anterior tract. Clark's columns extend from the end of the cervical part to the lumbar enlargement; their axis-cylinder processes pass through the gray substance in the periphery of the lateral columns. Thus it is seen that the cerebellar tract originates from the gray of Clark's columns and principally in the upper part of the lumbar enlargement and in the lower dorsal segment, turns to the restiform body, passes along the corpus dentatum, and enters the anterior part of the cortex of the upper worm. This tract conducts centripetal impulses and degenerates in an ascending manner as soon as the continuity of the spinal cord is disturbed and is important as the sensory tract of co-ordination.

The antero-lateral fasciculus, Gower's lateral tract bundle, which is in direct communication with the cerebellum, seems also to have a certain importance for the preservation of equilibrium. Moreover, the intermediary fibres situated between the pyramids and the posterior horns, and the antero-marginal fibres at the level of Deiter's nucleus, and partly the fibres of the anterior column may be regarded as centrifugal cerebellar tracts which convey motor impulses from the cells of the anterior horns to the anterior roots, and finally the medio-marginal descending bundle in Goll's tract. The olivary tract, as much of it as enters in relation with the lower olive, conveys tracts for the bodily equilibrium.

The nerve cells with which the dorsal root fibres are united by means of their terminal ramifications or collaterals mark the presence of halting places of centripetal conducting paths, which reach the spinal cord with the dorsal roots and consequently can be considered as answering to reflex centres.

The muscular sense, apparently chiefly the cutaneous sensibility, is conducted in the inner fibres of the posterior roots. The conduction for motility and muscular sense does not decussate in the spinal cord but somewhat higher up, while the conduction for cutaneous sensibility crosses nearly completely in the spinal cord.

The paths for the sensation of pain are found in the lateral columns; those for the muscular sense in the posterior columns, presumably Burdach's. The centripetal tracts of the cerebellar lateral column are intimately connected in the dog with the preservation of bodily equilibrium, while section of this is usually followed by manége and rotatory movements.

Diseases of the posterior nerve roots cause loss of sensibility and total anæsthesia in the corresponding part of the body situated below the exit of the roots; sensory ataxia; diminution of reflexes with preserved motility. Sensory ataxia is possible in diseases of the posterior horns, while the muscular sense and motility are preserved. The reflexes will be somewhat interfered with.

Disease of the posterior columns produces (provided the gray matter and not the roots in toto are affected), as a rule, decided disturbance of the muscular sense, of the sense of touch, sensory ataxia.

Signs of ataxia are to be expected in disease of the anterior and lateral ground bundles, as the lateral ground bundle is a continuation of the processes from Clark's columns to the cerebellar lateral columns.

Disease of the cerebellar tract produces special disturbance of co-ordination, perhaps also disturbances in reflexes as the cerebellar lateral tract gives off collaterals in the gray substance. The motility is not disturbed.

The posterior columns are the typical area of tabes dorsalis. Degeneration of the posterior columns at the beginning affects especially the root zones of the funiculi cuneati. In other words, the following fibres entering the spinal cord through the posterior roots are involved: 1. Those which ascend in the funiculus cuneatus and farther up in Goll's columns. 2. Those passing to the Clark columns and from there in the root fibres, or collaterals ascending in the cerebellar lateral tract. 3. The reflex collaterals passing from posterior columns in the posterior horns and continuing to the anterior horns. The first mentioned of these fibre bundles, which, through interruption in the root zones of the posterior columns, are separated from their trophic centres in the spinal ganglia; consequently the tract degenerates secondarily in the direction of the brain from the site of lesion—that is, Goll's columns degenerate. Furthermore, the area of their collaterals degenerates in the posterior columns up to their own tract cells. Clark's ganglion cells and the cerebellar lateral tract fibres which originate from them do not degenerate, but the collaterals between the root zones and the funiculi cuneati and Clark's columns degenerate, in whose surroundings a striking disappearance of the fibres in the gray substance is apparent.

The ascending crossed fibres in the anterior and lateral tract ground bundle, which conduct the cutaneous and pain sense, which are trophically influenced by the tract cells of the gray substance, do not degenerate; on the other hand, those which ascend without decussating in Goll's columns, fibres which serve the muscular sense, do degenerate as they do not receive the trophic influence below the medulla oblongata. It is not uncommon that in the beginning of the disease there is a decided contrast between the extremely slow development of the sensory disturbances of the skin on one side, and absence of tendon reflexes and pronounced co-ordination disturbances on the other. The greater part of the fibres which are used to convey the sense of touch, which presumably are in contact with the tract cells in the gray matter, and from this point ascend after having crossed in the anterior and lateral tract ground bundles, at first remain intact. The reflex collaterals which emanate from these remain intact, and consequently also the crossed cutaneous reflexes and the non-decussated, as the reflex arch is situated in all cases above the spinal cord.

In tabes, as the ganglion cells of the gray spinal matter do not usually degenerate, only the centripetal collaterals which pass to these suffer in their transmitting power. In consequence of this there is simply sensory ataxia, which is typical for tabes. The usual relaxed condition of the muscles in passive movements is regarded by Leube as a diminution of the reflex tone.

Friedreich's hereditary ataxia is a disease anatomically related to tabes, where constantly disease of the posterior columns and of the pyramidal lateral tracts is present, to which are added, in one-half of the cases, marginal degenerations and degenerations of Clark's columns and of the cerebellar lateral tracts. The symptoms are decided ataxia, which begins in the lower extremities and which later involves the upper and the speech apparatus, producing atactic dysarthria and usually nystagmus. The senses of taste, temperature, and muscle remain undisturbed. According to Leube, the reason that the latter are preserved although the posterior columns have degenerated, is to be found in the fact that in youthful patients other tracts serve for centripetal conduction. The ataxia depends upon the degeneration of the cerebellar lateral tracts and of Clark's columns, and the interference with conduction of the collaterals of the posterior columns and of the cerebellar lateral columns which serve for co-ordination.

EQUILIBRIUM TRACTS IN THE MEDULLA OBLONGATA.

If we follow the fibres which conduct co-ordination from the spinal cord through the medulla oblongata, we find in the lateral column, at the central end of the medulla oblongata, the olive appearing as a gray structure and increasing considerably in size upward. The two accessory olives are directly adjoining, the median lower and upper. The large lower olives are connected by the central tegmental tract with the basal parts of the cerebrum. The importance of the olivary cerebellar tract is to be found in the connection of the cerebellum with the spinal cord and represents the cerebello-fugal tract.

In the posterior columns there are gray nuclei connected with the posterior horns—namely, the nuclei funiculi gracilis and funiculi cuneati, with which probably the undecussated ascending sensory fibres come in contact, thence to pass between the olives through the internal arciform fibres to the opposite side, to form the so-called lemniscus layer. These are unquestionably joined by the sensory fibres which have already decussated in the spinal cord and ascend in the ground bundles of the anterior and lateral columns, so that all the sensory fibres are united in the mid-brain, especially in the region of the lemniscus.

The cerebellar lateral tract fibres maintain their position in the periphery, and in the medulla oblongata continue as the corpora restiformia, where they are augmented by fibres from the posterior columns to pass to the cerebellum.

The restiform body, in addition, receives a mass of fibres from the opposite side. The fibres of the restiform bodies are in connection with the fleece of the cerebellum, and through the latter with the connecting arm of the red nucleus and the tegmentum in the quadrigeminal region and the thalamus,—a fibre complex which probably belongs together functionally, and is of importance in determining the equilibrium of the body.

Through the pons the uncrossed pyramidal fibres which have passed from the medulla oblongata, and the frontal and temporal pontine tract fibres which are partly in contact with the ganglion cells in the pons and terminate in these, partly cross in the middle line in the cerebral peduncles and pass by the cerebellum. Situated dorsally to these are the tegmental part of the pons, the lemniscus, also the substantia reticularis composed of medullated fibres, especially of the anterior and lateral ground bundles, numerous scattered nerve cells, and, dorsally to these, the posterior longitudinal bundle composed principally of anterior ground bundles. The latter can be easily followed to the upper quadrigeminal region. The fibres collected in them are probably peripheric nerve-root fibres, partly communicating fibres between the various ascending cranial nuclei.

In the lowest part of the pons the cerebral central fibres of the nuclei of the cranial nerves, especially of the fifth, sixth, and seventh, decussate before they come in contact with other nuclei.

Functionally the medulla oblongata serves as a conducting organ, and partly to originate certain reflex movements whose centres are contained in it. Such are the secretion of saliva, swallowing, sucking, and masticating, closure of the eyelids, dilatation of the pupils through shading the retina, and dyspnœtic conditions of the blood, the inhibitory nerves of the heart, secretion of sweat, vasomotor impulses.

The pons and medulla are supplied with blood furnished by the vertebral arteries and the unpaired vessels originating from them—namely, the basilar and anterior spinal arteries. The latter supplies the oblongata and the nuclei situated in its lower segments, and the spinal accessory and hypoglossal, while the buccal, facial, abducens, and trigeminal nuclei are supplied by the basilar. The oblongata receives further blood supply from lateral branches of the cerebral artery and the inferior and posterior cerebellar arteries and the posterior spinal arteries.

Bechterew has experimented with injuries of the olive. While injuries to the spinal cord do not produce any forced movements, deep incisions of the lateral parts of the medulla at the level of the olives cause rotatory movements of the animal about its long axis to the injured side (just as in case of division of the cerebellar peduncles), distinct rotation of the head and trunk about its long axis, so that the cheek of the diseased side was almost directed down; the eye of the affected side was turned down and out, the healthy up and in; nystagmus was present on both sides toward the opposite side.

An injury of both olives causes decided staggering and wobbling of the head and of the trunk, with nystagmus. According to this author, the olive is in connection with the organ for the sense of touch. As the upper accessory olives are connected not only with the anterior acoustic nucleus but also with the nucleus of the abducent nerve, they may be regarded correctly as the centre which controls, with others, the reflex ocular movements. This is favored by the connection of the upper olives with the small brain, the tegmental nucleus, as lesions of the latter have always been followed by reflex disturbances in the position and movement of the eyes.

The form of paralysis characteristic for disease of the pons is the so-called alternating variety, in which the extremities of the opposite and the facial muscles of the same side are paralyzed. In addition to the paralysis of the extremities and the parts of the body supplied by the various cranial nerves, the affection of these centres spoken of comes into consideration in diseases of the pons and medulla. In rare cases ataxia is present owing to the involvement of the restiform bodies and the cerebellar lateral tract fibres, the posterior columns, and the fibres arising from the olive. Occasionally this is associated with vertigo which may at times be so severe as to appear almost as forced movements.

This is the first time that we encounter vertigo in following upward the sensory tracts. This is the first time that we approach two of the sensory tracts which instruct us as to the relation of our body; namely, we have the sensations of the skin, muscles, and joints, and of the vestibularis, whose involvement from a morbid process is easily possible. Below this the kinæsthetic sense alone was involved and showed its disease objectively by ataxia.

EQUILIBRIUM TRACTS IN THE CEREBELLUM.

The fourth ventricle is covered by the cerebellum, which is composed of a central part (worm) and of two hemispheres.

The gray matter in the interior forms the so-called central cerebellar nuclei: 1, corpus dentatum; 2, nucleus tegmenti; 3, nucleus globosus; 4, nucleus emboliformis.

The cerebellar cortex consists of gray matter surrounding a central white medullary substance of the cerebellum which exists as a central medullary nucleus and is prolonged in branches toward the periphery (the arbor vitæ).

The medullary nucleus consists of three medullated masses, the so-called cerebellar peduncles. The upper, anterior cerebellar peduncles connect the cerebellum with the cerebrum; they converge, and between them support the medullary velum.

The anterior cerebellar peduncles arise partly in the cerebellar cortex, partly in the central nucleus of the cerebellum. Bechterew distinguishes four portions of the anterior cerebellar peduncle. The ventral bundle possesses no relations with the cerebellum and forms the commissure between the nuclei vestibularis of Bechterew at the lateral corner of the fourth ventricle. The dorsal bundle is in relation with the tegmental nucleus and, through it, with the superior worm, and passes, after leaving the general decussation, to the red roof nucleus. The third middle tract of fibres is distributed to the nucleus globosus and embolus and then to the cortex. The fourth fibre bundle is situated partly in the cortex and partly in the corpus dentatum. After completed decussation the anterior cerebellar peduncle enters into the red nucleus. A part of its elements divide up into branches about the cells of this nucleus. In addition to this, a continuous connection with the oculomotor nucleus of the opposite side can be demonstrated. Indirectly there is a connection with the fore-brain.

The cerebello-petal tracts — namely, the continuation of the pupillary reflex fibres by which the cerebellum becomes instructed as regards the position of the pupils and eyeballs — are transmitted in the fibres to the oculomotor nucleus. The vertigo resulting from injury to the third ventricle makes it likely that these pupillary fibres represent the cerebello-petal tracts of equilibrium.

The cerebro-cerebellar tract, which transmits the impressions as to the position of our body in space and those producing the sense of our equilibrium, is conveyed in the main part of the anterior cerebellar peduncles which ascends to the cerebrum and which is continued from the red nucleus to the parietal convolutions. Accordingly a second communication between the fore-brain and the cerebellum, which passes through the cerebellar peduncles and ganglia of the pons and the cerebral fasciculus of the middle peduncle, influences the arrangements for equilibrium from the cerebral cortex.

As section of the anterior cerebellar peduncles does not cause any distinct disturbance of equilibrium, and as this represents the anatomical connection between the cerebellum and the cerebrum, Bechterew is led to believe that this region contains a centripetal tract along which the impressions which make up our sense of equilibrium attain the cortex of the cerebral hemispheres.

Circular movements, which appear after its section, are an objective expression of the sensation of vertigo, which is an immediate result of the operation. Then, if the vertigo is sufficient to become felt, the cerebellar preservation of the equilibrium remains undisturbed.

Bechterew distinguishes a spinal and a cerebral bundle in the middle cerebellar peduncle. The spinal bundle arises from the anterior and middle parts of the cerebellar cortex and is directed to the lower half of the pons where it ends in the gray matter of both halves. From this point fibres pass as the fasciculus verticalis, to the region of the nucleus reticularis, and the lateral area of the formatio reticularis, and finally to the antero-lateral ground bundles of the spinal cord. A few fibres pass from the pons to the quadrigeminal bodies with the lemniscus.

The cerebral bundle of the middle cerebellar peduncle arises from the distally superior and lateral parts of the cerebellar cortex, and, in the area of the upper worm and central nucleus, pass in the direction toward the upper half of the pons, where some of the fibres coming from the cerebrum along the median and lateral divisions of the cerebellar peduncles are interrupted.

The motor tracts from the cerebrum are joined in the ganglia of the pons by impulses emanating from the cerebellum which are conveyed in the middle cerebellar peduncles.

The posterior cerebellar peduncles consist of a lateral part — the restiform body,— in which most of the spinal tracts and the lower olivary tract pass,— namely, the cerebellar lateral tract to the cortex of the upper worm, fibres to the anterior and lateral tract nucleus and the fasciculi antero-lateralis and intermedius, to the fasciculus antero-marginalis and the anterior tract ground bundle, to the funiculus cuneatus, to Goll's nucleus, and to the gray olive. The last has decussated to the greatest part.

The tracts to the cranial nerves — especially the vestibular nerve — and to the upper olive are found in the median portion of the posterior cerebellar peduncle.

The neurites of the tegmental nucleus pass to the medulla of the worm, and from here can be followed to the middle line. Some of these, especially those from the central and lateral parts of the brain, join the acoustic bundle of the cerebellum and, after giving off collaterals, accompany the latter to the vestibular nucleus.

From the tegmental nucleus in the cerebellum fibres pass, after decussating in the middle line, from the anterior cerebellar peduncles surrounding, in the middle part of the field, the posterior cerebellar peduncle direct, or through the fibres of the trapezius to the upper olive.

Bechterew found that section of the posterior cerebellar peduncle in its entire course from the olive to its entrance to the cerebellum, as well as injury to the olive of the same side and section of the corresponding acoustic nerve, always produced rolling of the animal in the direction of the side operated upon. Section of the fibres passing below the aqueduct of Sylvius, in their course from the posterior lateral wall of the third ventricle to the antero-external part of the floor of the fourth ventricle, also section of the middle cerebellar peduncles in various planes, are always accompanied by rolling movements in the direction of the opposed side.

Section of the anterior cerebellar peduncles never caused any rolling but always circular movements with lateral deviation of the eyes, which was toward the operated side after section between the cerebellum and quadrigeminal bodies; there was deviation to the healthy side with nystagmus after section between the optic thalamus and the anterior quadrigeminal bodies.

Bechterew concludes from his experiments that the fibre bundles of the olives to the semicircular canals are conveyed in the corresponding posterior cerebellar peduncle and do not decussate up to the posterior external part of the cerebellar hemispheres. Lesions in this latter site are always followed by rolling movements toward the side operated upon.

Cerebello-petal tracts are consequently the central tracts of the vestibular branch, the cerebellar fibres to the posterior tract nuclei, the cerebellar lateral tracts, the cerebellar olivary fibres as well as the ascending antero-lateral fasciculus.

The spinal bundle of the middle peduncle is centrifugal. It is in connection, partly direct and partly through the raphe fibres, with the reticular tegmental nucleus and with the connecting arms of the formatio reticularis and the antero-lateral ground bundle of the medulla.

The centrifugal nature of the cerebellar superior olivary tract is made probable by the direct communication of the superior olives with the nuclei of the abducent nerves and their part in the mechanism of the reflex ocular movements. The cerebellar fibres passing in the anterior peduncles to the oculomotor nucleus of the opposite side have probably the same relation.

The centrifugal cerebellar tracts are the anterior marginal bundle, the fibres of the posterior longitudinal fasciculus, the intermediary bundle of the lateral tracts and part of the cerebello-olivary fibres, the spinal bundle of the middle cerebellar arm, as well as those fibre bundles of the latter which pass through the depth of the pons to the tegmental region, and finally, fibres which descend as the anterior lateral descending bundles from the cerebellum to the upper olive, to Deiter's nucleus, and in the lateral tract nuclei.

The following sensory stimuli are concentrated in the cerebellum: the sensation of muscular sense passing along the posterior columns and the posterior-column nucleus to the cerebellum, as well as the visceral sense, presumably transmitted by the cerebellar lateral tracts; the sensation of the vestibular nerve and probably of the pupillary fibres.

The cerebellum is functionally in close relation with co-ordination. It is probable that it is not directly influenced by motor tracts, but inasmuch as the varying sensory stimuli are brought together in it, a regulating influence is exercised on the innervation of the motor tracts. From its direct and indirect connection with the ganglion-cell systems of the brain, the cerebellum is enabled to control the combined activity of numerous muscles, which is necessary for maintaining the equilibrium of the body.

According to Luciani, the cerebellum may be regarded as a small aiding and strengthening apparatus for the entire cerebro-spinal system. Its destruction is shown by asthenia, atonia, and astasia (in the dog).

The experimental results are supported by the comparative study of the cortical fibres of the cerebellum in various animals. In man, the sheep, the chicken, and dove a direct correlation has been demonstrated between the development of the cerebral cortex and the acts of walking and standing. In sheep and chicken this function begins immediately after birth, and the fibres of the cerebellar cortex at this time are found to be completely medullated. In other animals, on the other hand, a successive medullation first takes place after birth.

Leube writes that injuries to the cerebellum produced in experiments cause severe permanent disturbances of co-ordination only if larger parts of the cerebellum are affected. On the other hand, deep injuries to the worm have the same effect. After one-sided superficial lesion of the restiform body nystagmus was produced, and forced rolling movements set in after lesion of the peduncle and the pons, just as in injuries of the various other parts of the central nervous system. It is distinctly to be remembered that the activity of the will and of the senses, as well as the intelligence, is in no way interfered with by a lesion of the cerebellum.

According to Adler, the function of the cerebellum is to maintain the bodily equilibrium and to add strength and precision to movements.

Bechterew emphasizes that the symptoms appearing after injury to the cerebellum are not to be explained by simple functional destruction, but rather by want of harmony in the activity of the remaining cerebral parts.

Schiff observed, after unsymmetrical injury to the cerebral hemispheres, nystagmus of short duration, strabismus after prolonged irritation, or both combined. These symptoms remain permanent if the injury included the inter-peduncular part of the cerebellum, such as the uvula or the nodulus. In hemorrhages into the cerebellar peduncles a deviation has always appeared on the injured side, usually to one side, and the eye of the affected side shows nystagmic movements as long as the animal remains nearly or completely quiet. If the head or body is energetically moved, the nystagmus of the affected side becomes converted into a real strabismus which does not change its main direction, but has interrupted, small, convulsive movements of the eyeball.

As the vestibularis is principally connected with the cerebellum of the same side, irritation of the right cerebellum causes turning or rotation of the body from right to left, just as is noticed after irritation of the right vestibularis. This confirms Luciani's experiments. After a period of irritation following the removal of the right cerebellum, dogs made rolling movements from right to left. Nystagmus and strabismus were also found in this form.

After incomplete removal of the right cerebellum the right eye deviated always in the same direction, down and in, and was frequently associated with nystagmus in dogs and monkeys. In the latter, nystagmus was on both sides. From this it seems that the cerebellar lobes in the dog serve to represent and to perform movements about the main axis. In four dogs from whom Luciani had removed the middle lobe of the cerebellum, opisthotonos was present as an irritative symptom in varying degrees up to bending back of the head on the spinal vertebræ, together with tonic extension movements of the anterior extremities; and in two, convergent strabismus; in two monkeys, flexion of the head and neck backward and tonic flexion of the arms were present.

In removal of only the middle lobe irritative symptoms were symmetrical. According to this, the middle lobe appears to serve for movements in the antero-posterior diameter. This corresponds to the convergent strabismus, the fixing of the eyes upon a visual field apparently brought as near as possible.

In one of Luciani's dogs, after removal of the right half of the cerebellum, the declive anterius, the lower part of the declive posterius and flocculus were uninvolved. Irritative symptoms were turning to the right in a circle about the vertical axis in the middle point of its back. The right anterior extremity was in tonic extension. In another, the monticulus, the declive posterius and pyramid were affected in the section involving the upper two-thirds of the thickness of the middle lobe, not exactly in the median line but a little to the left. Manége movements to the right resulted. In two blind dogs, notwithstanding that the right half was removed, rollings did not result, but in one there were manége movements.

In complete removal of the cerebellum Luciani observed in one case tonic convulsions of the muscles of the neck, extension of the anterior extremities; clonus of the posterior extremities in another. The eyes were widely opened, the pupils dilated, and convergent strabismus was present in two monkeys.

The incomplete removal of the cerebellar halves and of the middle lobe makes it probable that in the cerebellum, just as in the sensory and motor regions of the cerebrum, the activity of certain muscular groups is connected with certain regions, and that the sensation and performance of movements forward and backward, with dilatation and possibly contraction of the pupil, as well as convergent strabismus, are related to the middle lobe.

Rolling movements about the long axis, manége movements with nystagmus and strabismus in and down, perhaps also nystagmus rotatorius, are connected with the lateral lobes. This is supported by the presence of an unusually well-developed middle lobe in animals that have to perform movements in a vertical direction, as fishes and birds, where the macula lagenæ is present.

The ocular movements give us a clue to the disease of various parts of the cerebellum or labyrinth and the oculomotor nerves. We must, then, examine the following:

Horizontal nystagmus to the right: involvement of the horizontal canal to the left; left cerebellar lobe, and sensation and act of rotating to the left. Rotatory nystagmus: frontal canal; sensation and action of rolling movements. Convergent strabismus: sacculus and utriculus, middle lobe, sensation and action of vertical movements forward or backward, with narrow or dilated pupils.

Perhaps it will be possible to determine the nerve tracts which connect the various individual points.

The centre for the activity of the cerebellum is sub-cortical and acts without consciousness. Frogs, rabbits, and doves, after their cerebral hemispheres are removed, can walk and stand. The same was observed in Goltz's dog without a cerebrum. Pathological experience in man shows us that epileptics, where the cerebrum is excluded, may still walk and perform motions. Löwenfeld was able to produce movements of vertigo in deeply chloroformed rabbits, also with the galvanic current in the case of sucklings which were asleep. All of these subcortical centres have their representation in the cerebrum.

An observation of Berthold favors the subcortical location of vertigo—namely, that the pendulum-like movements of the head are continuous in sleep; and another observation of Gowers, that a patient in sleep bent himself so that his head projected over the edge of the bed or came to lie next to the foot-end. In this case spasms in the arms occurred later.

Hitzig writes: "In regard to the relations of the various parts of the cerebellum to vertigo, it now seems to be the general opinion that vertigo is always present when the basal parts of the worm, and especially its posterior portions, are involved."

Leube writes: " Similar to the results from experiments, patients with cerebellar affections suffer from vertigo. Usually it is absent in a quiet position of the body, but becomes very accentuated as soon as the patient sits up or walks. If the vertigo is very pronounced, involuntary attempts may result in producing forced movements, which balance the disturbance of the locomotion sense produced by the lesion in the cerebellum. This may even appear in the conscious state, and in patients who are perfectly conscious may be present without vertigo. These forced movements are to be regarded as an irritative symptom, and if they take the form of a rolling about the long body axis, as a symptom of affection of the pontine peduncle. The peculiar forced movements of the eyes described by Nonat, where one is turned down and out while the other looks up and in, also point to this lesion.

" A second symptom of cerebellar disease is disturbance of co-ordination. Walking is staggering, wavering, like that of a drunken person. The feet are put down abruptly. Standing on one leg or with closed eyes is impossible. The wavering, however, does not necessarily need to become more pronounced on closing the eyes. It may, in fact, cease, as opposed to the ataxia of the tabetic. In lying down, the patient is able to perform definite movements. The muscular sense and sensibility are intact and the tendon reflexes normal. The ataxia is generally limited, in disease of the cerebellum, to the legs and trunk. In the vast majority of cases cerebellar ataxia means an involvement of the worm. Occasionally nystagmus is present; headache and vomiting are sometimes pronounced, more so than in other cranial affections."

In cases where closure of the eyes is not followed by increased wavering, or where this symptom ceased, we must assume that impressions conveyed along the visual tracts can be disregarded and that this tract may be injured or may be excluded from the preservation of the equilibrium.

The increase of the wavering on standing with the legs close together or on one leg, shows that the kinæsthetic tracts cannot be excluded, and that they are consequently still in full activity. The preservation of the cutaneous muscular sense would only exclude a lesion of those paths going from the spinal cord to the cerebral cortex, not those of Goll's or Burdach's nuclei to the cerebellar cortex or of the direct cerebellar lateral tracts.

In disease of the pontine peduncles, the three centripetal equilibrium tracts are not involved. The consecutive forced rolling movements are performed without vertigo, as resulting from an injury to the centrifugal fibres which pass from the cerebellar cortex to the pontine ganglia and influence the pyramidal tracts.

The so-called cerebellar ataxia in which definite movements are performed while lying down, I cannot regard as such, but rather as an expression of an unconscious disturbance of the sense of position.

EQUILIBRIUM TRACTS IN THE MID-BRAIN.

The cerebral peduncles passing out from the pons enter anteriorly and externally in the hemispheres, and form, as trunks, a connection between the hind- and fore-brain.

The peduncle consists of a ventrally situated pes and a dorsally situated tegmentum, separated by the substantia niger. The white fibres of the pes consist of various fibre bundles coming from the cerebral cortex through the inner capsule, chiefly the pyramidal tracts. The tracts for the motor cranial nerves, which make a turn in the pons and medulla, and their nuclei, are situated to the inner side of these. The anterior cerebral cortical-pontine tract from the frontal lobe, and the posterior from the temporo-parietal and occipital lobes, which pass to the pons and cerebellum, are situated on the lateral side of the pyramidal tract.

The tegmentum contains on both sides of the median line, the red nucleus, which transmits the medullated fibres between the thalamus and cerebellum, which after passing through the red nucleus decussate and form the anterior cerebellar peduncle. Farther up in the basal parts of the thalamic region external to the red nucleus, there is a lenticular body, the corpus subthalamicum, containing nerve cells, which gradually defines the cerebellar peduncle in the place of the substantia niger.

The main fibre bundle of the tegmentum is the lemniscus, a most important sènsory tract. The main lemniscus conveys the tracts of the posterior columns of the cord centrally through the peduncles. This is the main sensory tract. It can be taken for granted that the lateral tract fibres of the lemniscus convey the impressions of the cutaneous senses, while those elements adjoining the posterior tract convey the impression of the muscular sense. The sensory spinal-cord fibres form in the medulla oblongata with the aid of the inter-olivary layer, the groundwork of the lemniscus. Most of the sensory nerve nuclei are in crossed relation with the lemniscus. This body is always well differentiated and can be followed into the anterior quadrigeminal bodies forming the deep medullary layer. Toward the brain, lemniscus fibres radiate with fibres from the red nucleus and the sub-thalamic region, to the thalamus, in part also from the sub-thalamic region through the lenticular nucleus to the cortex of the parietal lobe. This fibre radiation represents the main division of the lemniscus, which is to be designated as the median upper lemniscus. The lateral lower lemniscus travels from the upper half of the pons and from the upper olive, situated sometimes more distally in the level of the facial nucleus, to the posterior quadrigeminal body.

The roof of the mid-brain is formed by the quadrigeminal bodies whose anterior pair serve as the centre for the optic nerve, inasmuch as optic fibres radiate from the optic tract through the anterior arm to the anterior quadrigeminal body. On the other hand, internal fibres of the radiating corona arising from it, together with fibres originating from the thalamus and lateral geniculate bodies, pass through the posterior third of the internal capsule to the cortex of the occipital lobe. Anteriorly the quadrigeminal bodies are in relation with the nuclei of the oculomotor nerves. Fibres presumably pass from the posterior quadrigeminal bodies to the cerebral cortex. Fibres of the deep medulla of the anterior quadrigeminal bodies pass in a radiating manner internally to the gray substance of the aqueductus Sylvii. On the ventral side of the posterior long bundle they form the fountain-like decussation.

The bundle of the fountain-like tegmental decussation from the mid-brain to the formatio reticularis and finally to the anterior column of the medulla, without doubt conveys optic reflexes to the organs of motility. Consequently, a conformity between the movements of the extremities and visual impressions can be produced by reflex paths. The very well pronounced longitudinal fibres in the formatio reticularis, which Bechterew has called the central tegmental tract, are regarded by him to be related to the function of bodily equilibrium on account of their certain relation to the lower olive.

The anterior quadrigeminal bodies as well as the lateral geniculate bodies are intimately associated with the visual function. Optic impulses pass in the ganglia of the former to the motor sphere. Irritation of the lower quadrigeminal bodies produces ocular movements, and movements of the extremities of the opposite side owing to the immediate relation of the posterior quadrigeminal bodies, by means of the lateral lemniscus and fibres of the trapezoid body, to the anterior acoustic nucleus on the one side and the reticulate tegmental nucleus and the pontine nucleus on the other.

The aqueductus Sylvii is limited by the rather thick layer of gray substance, the central cavity gray which extends from the commissura mollis of the third ventricle to the pyramidal decussation and contains the nuclei of the cranial nerves and, in the mid-brain, those of the oculomotor and the trochlear nerves. Longitudinal fibres pass below and externally from this central gray as a continuation of the anterior tract ground bundles, as the posterior longitudinal bundle which, coming from the region of the infundibulum and anterior process of the thalamus, passes into the formatio reticularis. In addition, the posterior longitudinal bundle contains communicating fibres with the various cranial nerve nuclei.

Destruction of the quadrigeminal bodies produced blindness and reflex immobility of the pupils by involving the reflex arc between the optic and the oculomotor in its optical part. A direct communication between the anterior corpora quadrigemini and the nerve nuclei of the ocular muscles has been anatomically demonstrated.

In addition, destruction of the corpora quadrigemini produced ataxia, especially disturbance in balancing of the body, probably from a result of injury to the co-ordinating tracts which are indirectly in relation with the quadrigeminal bodies. Centres for the stomach have been found in the corpora quadrigemini, also vasomotor fibres.

Siebenmann in his investigations on tumors of the mid-brain, especially of the corpora quadrigemini and tegmentum, speaks of this fact, of interest to the aurist, that vertigo on lying down was absent in every case. It seems that it only appears to enter into the composition of the clinical picture, and only in one form is a part of the symptom-complex of ataxia—namely, uncertainty of gait, the Romberg phenomenon, which must be separated from true vertigo.

Bechterew cites a number of cases in which vertigo was observed in disease of the third ventricle. The same author remarks that to the uninitiated observer it is almost impossible, from the appearance, to guess whether, in the particular animal experimented upon, the olivary body and semicircular canals or the central gray substance of the third ventricle have been affected. The cerebellum must be regarded as a central organ of the bodily equilibrium, while the olivary body and semicircular canals and the central gray substance of the third ventricle represent peripheric organs which serve as a region for certain centripetal impulses. They may be considered as the peripheric organs of equilibrium.

Bechterew regards the third ventricle as a structure similar to the labyrinth in which sensation of movements is perceived from the pressure of the liquid exerted upon the walls. If the inner surface of the funnel on both sides were divided into five similar triangular fields, starting from the apex below and spreading out above, the following conditions were observed on sections going through the various fields. Injury to the anterior segment from the optic recess upward along the lamina cinerea and the floor, was followed by slight nystagmus internally, the pupils equally dilated, the snout extended forward, and the neck depressed. If the animal was let loose, it would describe irregular and unrestricted running movements.

Injury to the antero-lateral segments from the facial up to the foramen of Munro, was followed by lateral deviation of the eyes to the diseased side and nystagmus usually in the opposite direction, the corresponding pupil was dilated, the head depressed, the neck bent back toward the side of injury, rotation to the diseased side, and later moving in a forward direction with a certain tendency to deviate toward the healthy side.

Injury to the lateral segment caused lateral deviation of the eyes to the diseased side with the addition of nystagmus. Occasionally the eye on the diseased side would be turned upward, the corresponding pupil dilated and only react consensually. The head and trunk were turned toward the healthy side. Manége movements were toward the diseased side. There was occasional falling on the same side.

Injury to the posterior segment from the funnel toward the aqueductus Sylvii produced a convergence of the ocular axes downward and inward, violent nystagmus out and up, pupils moderately dilated, reacting to light. The head was not thrown backward. After a number of hours there were restricted movements forward.

Injury to the postero-lateral segment caused sharp turning of the head and trunk about the long axis toward the healthy side, the eye of the diseased side deviated up and out, the other down and in; the pupils were dilated at the maximum and did not react; on both sides there was distinct nystagmus in the opposite direction to the deviation; rolling movements of both eyes about the longitudinal axis in the opposite direction are not uncommon; forced position on the healthy side. If the injury is more pronounced, there are rolling movements about the long axis to the healthy side. Injury to the postero-lateral segment on the other side terminated the ocular deviations; turning the head and rolling movements; both pupils were very wide; there was horizontal nystagmus, pendulum-like movements of the head and trunk, and disturbance of equilibrium. Electrical irritation caused the same symptoms in the opposite direction.

Bechterew assumes that the optic nerves put on a stretch by the movements of the eye exert pressure upon the wall of the third ventricle and thereby influence the nervous elements.

Presumably the tracts which have been spoken of in the discussion of the central course of the optic nerve, passing from this nerve to the third ventricle, were injured in Bechterew's experiments and prevented the cerebellum from receiving the visual impulses necessary for equilibrium.

Jacques Loeb demonstrated in the shark that a one-sided injury of the cerebrum, mid-brain, and cerebellum does not produce any disturbance of orientation; this, however, is surely produced by removal of, or section through, the base of the mid-brain. The parts of the medulla which join the mid-brain cannot be injured on one side only without producing disturbance of orientation; this is also absent if the section approaches the caudal half or quarter of the fourth ventricle. The forced movements directed toward the right, which follow section of the right half of the medulla oblongata about in the middle of the fourth ventricle, cease immediately on touching the animal. The sense of touch prevents them. The left eyeball is turned up, the right down; the right pectoral fin was rolled dorsally, the left centrally; at the same time it was somewhat elevated toward the head. In a quiet position the right side was entirely or nearly half dependent.

Jacques Loeb concludes that after one-sided injury to the mid-brain and medulla oblongata the causes of disturbances of orientation are qualitatively and quantitatively identical with those following section of the auditory nerve,—in this relation the auditory nerve corresponding to the part of the medulla oblongata on the same side and to the mid-brain on the opposite side. In other words, a section of the auditory nerve and medulla oblongata on the left side aurally from the auditory nerve, causes manége movements towards the left, just as section of the right mid-brain does. The manége movements after section of the left mid-brain, and the rotations and associated changes of position following section of the right medulla can be completely retarded (inhibited) through the simultaneous section of the left auditory nerve.

As opposed to Ewald, this author mentions that after one-sided section of the auditory nerve in some animals, associated changes of position of the limbs and a corresponding anomaly of tension of the muscles appear. The tension anomalies of the bulbar muscles set in with the first innervation in animals which have been previously etherized.

The importance of the mid-brain and certain parts of the medulla oblongata for forced positions, movements, and associated changes of position of the eyeballs and sinews depends upon the circumstance that these parts contain components of the auditory nerve. After bilateral section of the auditory nerves in sharks these fish have a tendency to rise vertically in the water.

EQUILIBRIUM TRACTS IN THE CEREBRUM.

The sensory motor regions may replace the cerebellum to a certain extent. Thus their influence upon the preservation of the body equilibrium is assured.

The posterior roots, in addition to the trigeminal and vestibular nerves and ascending elements of the posterior and lateral tracts, their continuation in the lemniscus and the posterior cerebellar peduncles, and other paths to the cortex may be regarded as centripetal paths of the sensory motor sphere of touch which extends from both central convolutions and posterior segment of the frontal convolution and part of the parietal to the adjoining parts of the median surface of the hemispheres. Motor impulses are conducted principally by the pyramidal tracts with their spinal prolongations which join the root cells of the anterior horns; in addition, the centrifugal cranial nerves in the pyramidal tracts and in the accessory lemniscus, the fronto-pontine system, the corona radiata, the corpus caudatum and the putamen, the tracts from the cortex to the substantia niger, and finally from the radiating corona of the optic thalamus.

By disturbance in the region of the anterior cerebellar peduncle, the impressions of a lower order formed in the cerebellum about our position are erroneously transmitted to the cerebrum and vertigo is thus felt. By injury of the cerebral fibres of the middle cerebellar peduncle, the influence of the cerebrum on the cerebellum is disturbed, and the result of this can also be perceived as vertigo. By influencing the lemniscus tract up to the sensory motor zones, the voluntary realization of the centripetal sensations of position are prevented, and vertigo appears in the attempt at voluntary changes of position. Injury of the sensory lemniscus tracts up to the cerebral cortex leads, on account of the proximity of the pyramidal tracts, immediately to motor symptoms. Owing to the extended distribution of the sensory motor regions, an injury will cause erroneous conceptions about positions in space and general brain symptoms, especially loss of consciousness.

BY ALL OF THESE DISTURBANCES THE UNCONSCIOUS CEREBELLAR PRESERVATION OF THE EQUILIBRIUM WOULD NOT BE PREVENTED.

On the other hand, circumstances which lead to general congestion of the brain suddenly increasing the pressure within the cranial cavity, or in the case of a different position of the original trouble causing a complicating affection of the cerebellum or of the sensory motor region, would also lead to vertigo.

The vertigo appearing in diseases of the cerebrum is associated with more or less complete loss of consciousness. The patient suddenly experiences obscurations (blurring of sight). However, false impressions about his relations to surrounding space do not occur. These attacks of vertigo represent the mildest form of the apoplectic insult and may appear in the most diverse cranial diseases (progressive paralysis, multiple sclerosis, hydrocephalus, tumors).

Hitzig differentiates between cerebral and cerebellar vertigo following tumors. Tumors which are accompanied with attacks of vertigo of an epileptiform character with or without convulsions, are, with the greatest probability, to be looked for in the proximity of the motor region. The attacks of vertigo of the other class are characterized by a general congestion of the brain. As these attacks usually appear with headache and vomiting, they presuppose the existence of a sudden, general, increased intracranial pressure.

The cerebellar forms are distinctly different from these central attacks. The symptom is here characterized by its unusual severity, by the frequency and duration of the attacks, which generally are also characterized by the presence of apparent movements in a definite direction. These attacks need not be epileptiform nor of a congestive character. They may appear without convulsions, clouding of the sensorium, headache, or vomiting; though convulsions, unconscious as well as congestive attacks, are not rare in cerebellar tumors. Just as in the cerebellar attacks, they are not infrequently terminated by vomiting.

Destruction of the occipital convolutions has sometimes resulted in forced movements, injury of the frontal lobe, with disturbance of the bodily equilibrium. The tracts of the pons appear as paths for centrifugal impulses which are in direct relation with the visual act, as, for instance, that impulse which is necessary to ascertain the position of the ocular axes, of the head, and of the trunk in the different positions.

Gowers assumes that in severe attacks of aural vertigo the cerebrum may be involved from the cerebellum and that transient unconsciousness may be present.

If we consider these three sensory paths which serve to instruct us of our position in space to be pathologically affected, we may then differentiate between the symptoms of irritation and those of defect.

An irritant acting upon any part of the ocular reflex arc can, if it reaches the necessary severity, produce inferior ocular movements—nystagmus. On the other hand, one depending upon the kinæsthetic sense tracts may lead to ataxia of varying severity. If the point of attack lies in the peripheric sensory or motor nerves, the ataxia is not as pronounced as when the site of the lesion is higher up in the spinal cord. The vestibularis has no centrifugal reflex arc. Its irritation, if it is sufficiently severe, always produces vertigo, which first acts upon the oculomotor nerves on the one hand and on the motor tracts on the other. Thus nystagmus and staggering are the only objective appearances of vertigo visible to the observer. Both depend upon a false and frequently unconscious representation of our bodily position.

We have seen that in movements of the visual field certain regular contractions appear which up to a certain degree, notwithstanding the motion, produce definite visual impressions. The nystagmus in vertigo is not inco-ordinate, atactic but quite consequential. If, for example, pressure is exerted upon the vestibule of the right external auditory canal, an impression is produced as if space turned toward the right (the body to the left); the eyeballs slowly follow the apparently moving visual field and return from the terminal position with a quick jump, or, if the irritation is more marked, they assume a position just as in the case of quick rotation in an angle according to which the contractions have taken place.

As an example of accommodation upon an apparently approached or distant space, we may consider the narrowing and dilatation of the pupils which has been observed in vertigo by Rumpf, Mendel, and myself, in an injury to the external semicircular canal. In the same way the static muscles bring the body in the position which, from the standpoint of the erroneous impression, is the right one.

Thus, Kreidl's crabs, whose otoliths had been replaced by iron ones, and upon whom a stimulus has been exerted by the electro-magnet, swam in a crooked direction sufficient to equalize the pressure upon the two sides; in other words they appeared to be swimming in a straight line.

An inco-ordinated atactic movement does not exist. Ewald's doves, with the labyrinth defect on one side, appeared to turn the head in accordance with the erroneous impressions transmitted from the one remaining labyrinth. If the doves exhibit atactic symptoms in their rolling movements, this depends upon a lack of tone which, in these animals, is exerted upon the muscles. In man this muscular tone is absent. In man it is generally easy to distinguish between disturbances of vertigo and of co-ordination. Frequently the sensation of vertigo, as spoken of before, and an erroneous apparent position of the surrounding space are described. The vertigo often disappears on lying down, while the ataxia continues. On the other hand, in the horizontal decubitus the apparently inco-ordinated movements of the legs cease. The knee and heel experiments are definitely performed, and the other leg is brought with certainty into the position of the passive one. The apparent ataxia or irregular play of the static muscles is a struggle between the attempt to bring the body into an apparently correct position, and the effort to improve a position which is immediately recognized as false,—the struggle between voluntary and subcortical innervation, which Schmidt-Rimpler has described as typical nystagmus for the eyes.

It is impossible, in ordinary clinical observation, to separate this maze of movements. We have the experiments of Mach, previously quoted, to enable us to do this. Luciani's experiments have shown that part of this muscular activity arising from the cerebral cortex is consequently voluntary. After removal of the sensory motor cerebellar hemispheres, and of the gyrus sigmoideus, after removal of the cerebellum, Luciani has demonstrated that the compensatory movements which animals without a cerebellum are capable of, enable them to preserve the equilibrium in standing and walking and swimming, and depend upon the sensory motor spheres of the cerebrum, and that these may be separated from the syndrome of defect symptoms of the cerebellum—namely, the simple resection of the gyri sigmoidei, which represent the most important segments of this sphere.

In order to produce the immediate appearance of staggering and of nystagmus in cases of vertigo, the following different measures are at our command:

We may first increase the stimulus on the same sensory path which has heretofore been too weak for their production. This is very simple in slight subjective vertigo following fistula or irritation of the semicircular canal. Slight pressure upon the fistula produces nystagmus and staggering if the very sensitive vestibular apparatus has not been injured. If no fistula be present, this can sometimes be accomplished by increased pressure in the auditory canal, which is conveyed through the fenestra to the internal ear. In other cases we must add the physiological to the pathological stimulus by causing movements of the head in the plane of rotation of the semicircular canal which is to be examined, thereby producing lymph currents or bringing the otoliths of the macula sacculi and utriculi out of their position of equilibrium. By walking straight ahead the macula utriculi may be excited; by bending the head sideways, the sacculi become irritated. Rotating the head takes place in the plane of the greatest part of the external semicircular canal. If the head be rotated about an axis of 45° deviation to the right shoulder, then the right anterior or superior and the left posterior nasal meatus are brought in the sphere of rotation. If the head be bent toward the left shoulder, then the left anterior, the left antero-superior, and the right posterior are situated in the plane of rotation.

Ocular vertigo in certain extreme ocular movements is frequently increased to such a degree as to lead to nystagmus. The vertigo, depending on muscular sense just as the vestibular vertigo, can possibly be increased by electrical irritation to the onset of visible symptoms. However, for each individual person the unusually variable irritation threshold and the strength of the current must be known, in order to allow us to say whether we have to deal with a pathological stimulus or hypersensitiveness.

The second path by which we may increase a too weak stimulus is that by producing an irritation upon one of the other of the three sensory paths spoken of, which together with the pathological stimulus suffices. This occurs in vestibular vertigo, as, for instance, in the erect bodily position, which of itself frequently permits the onset of vertigo, while the horizontal position, without any excitation of the static muscles, may check nystagmus. A turning of the eyes to the extreme angle toward the healthy ear may produce nystagmus in the milder forms of labyrinth vertigo.

I do not know whether attempts have been made to produce nystagmus and staggering in eye patients by kinæsthetic or labyrinth stimuli or by irritating the spinal cord through irritation of the eyes and of the vestibulum. They should be practised in such a way that those suffering from spinal or eye disease are rotated or perform one of the movements described above to irritate the labyrinth, or those suffering with spinal disease may become irritated by carrying prismatic or cylindrical glasses before the eyes. Kinæsthetic stimuli in those suffering from eye or labyrinth disease could be practised by Mach's apparatus for passive rotating by movements of falling water.

A second group of diseases leading to vertigo is that in which the principal centripetal tracts are defective. If only one is wanting, the other two compensate. Tabetic patients, as long as their malady is localized in the spinal cord, are able to find their position through the eye and the vestibule. If the eye is excluded, vertigo sets in.

Bickel divided the posterior spinal roots of the posterior extremities in the dog. After a short time both labyrinths and the cortical zones were removed. He concludes from his experiments that the fact that the atactic disturbances, after producing this injury to the sensory spinal roots, can completely disappear is not of great importance. If, on the other hand, in animals who have compensated for their ataxia the labyrinths are extirpated, then again ataxia supervenes, we must conclude that compensation of the sensory ataxia does not depend on degeneration of the nervous tracts, but that other organs, as the labyrinth and other sensory organs, have produced the compensation. It is very probable that the optic tract and corpora quadrigemini and the cerebellum are important factors in this.

Max Egger described a case of bulbar tabes with disease of the third, fifth, seventh, eighth, ninth, and tenth cranial nerves. Of the oculomotor, the branch to the left external rectus alone was paralyzed. There was total deafness; preservation of the patellar, ankle, and elbow reflexes. The right radial reflex was absent. There was no wavering on standing with closed eyes or on one leg. The gait was normal, not atactic nor wavering even with closed eyes. If, however, the patient while walking straight forward altered the position of the head—for instance, if the head which had been previously turned toward the left side was turned to the right, she lost her equilibrium and fell toward the side to which the head was turned. Passive rotations are not perceived. There is no nystagmus and no rotatory vertigo. An inspection, however, of a turning apparatus suffices to produce immediate vertigo. In this case the kinæsthetic tracts were normal. Slow stimuli of the vestibularis and oculomotor caused vertigo.

Nearly complete exclusion of all three tracts can be assumed to take place in patients without a labyrinth while swimming under water. Breuer has described the remarkable sensations experienced by the deaf-mutes while swimming under water. An intense fear is felt, and even in only a few feet of water they swim directly underneath the surface without being able to raise the head by a simple movement.

A third and last possible means of producing violent nystagmus would be that in the pathological defect of one path an irritation of one of the others should take place. This could be artificially produced as follows: The blind must be rotated, or, according to Mach's precepts, their muscular sense must be deceived. Advanced tabetic patients in whom the irritative symptoms have disappeared and pure paralyses are present, should also be rotated, or should be removed as described before, or by an improper glass be deprived of the use of their eyes. At this point should be mentioned the clinical observations of Ménière's symptoms in tabes, which have been observed by Maris and Walton fourteen times in twenty-four cases, after the progress of the disease had affected the nucleus of the vestibularis.

Should we, finally, regard the various combinations, we may say that the stimulus must have a certain strength if it is to produce vertigo through one of the three sensory paths, and that weaker stimuli in two different sensory paths may be combined to produce a more permanent result.

Further, in the absence of two sensory paths, the usual positions and changes of position are sufficient to produce vertigo.

The site of the injury can vary according as the tracts are affected inward from their peripheric terminal organs to the points where the fibres leave them to communicate amongst each other. This location is in the middle part of the cerebellum (the worm), where Deiter's nucleus and the vestibularis send communicating fibres to the oculomotor nuclei and to the anterior horns of the spinal cord, and all three tracts are in communication with the cerebellum.

The true rotating vertigo is probably to be referred to the ocular and vestibular paths; the other erroneous conceptions of our bodily position may be caused by these as well as by the kinæsthetic paths in the most varying combinations.

The experiments to increase a slight degree of vertigo up to a grade of visible symptoms—namely, wavering and nystagmus—can, under certain circumstances, aid in making a diagnosis.

If one of the three paths can be excluded without increasing the vertigo, then it is useless and paralyzed. If the vertigo is thereby made less, then it is the site of the lesion. If the vertigo is made greater, then it is necessary and useful as a compensating agent and is consequently little damaged.

Increasing the stimulus does not aid us in making a diagnosis of location. On the other hand, in order to determine the site of the morbid cause, certain accessory symptoms should be investigated. For the eyes, the appearance of double images; for the ears, tinnitus and loss of hearing; for the spinal cord, reflex paralyses or increased paræsthesia, sensation of touch, sensation of pressure, sensation of pain, localization, temperature sense, power, consciousness of position of the extremities, and stereognostic perception.

REPORT ON THE TRANSACTIONS OF THE SECTION ON OTOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. JOSEPH KENEFICK.

MEETING OF OCTOBER 9, 1902, JAMES F. MCKERNON, M. D., CHAIRMAN.

Presentation of Cases.

Dr. Thomas J. Harris presented for Dr. Phillips a case of **latent healing of extensive mastoid wound treated by means of skin graft.**

The patient, W. W. W., was first seen in February, 1901, complaining of general mastoid symptoms, the point of interest in the case being the rapid development of these symptoms. The attack set in on Wednesday; on Thursday a complete paracentesis (internal Wilde's) was performed; the following day the mastoid symptoms were so severe that the patient was sent to the hospital, where the ice coil was applied without effect. The next Monday a mastoid operation was performed and revealed extensive bone disease with exposure of the lateral sinus and brain. Microscopic examination showed the presence of streptococci. The subsequent history of the case is, that since this operation in 1901, three other operations have been performed, each time some diseased bone being found. The last operation was in April, 1902. In August of this year skin grafting was decided upon, and healing took place except in the upper portion of the wound. Ten days ago a second skin graft was made, resulting in almost entire healing.

The case is interesting as illustrating the assistance of skin grafting in latent healing of mastoid wounds.

Discussion: Dr. Dench thought the method of healing as advocated by Dr. Phillips and illustrated by the case presented was very successful, and was a valuable addition to the treatment for inducing healing in old mastoid wounds. He had conceived a plan of filling the wound with blood and allowing the clot to organize, afterwards placing a skin graft on top. Another question suggested in these cases is the relief of the deep pit which remains behind the ear. He referred to an article on this subject by a Vienna surgeon who advocated the injection of paraffin under the skin to relieve the depression. In his own experience he had found that in a number of mastoid wounds that would not heal there was still some necrosed bone present, and this being discovered, he did the radical operation at once, filling in later with a skin graft. He reported one case of skin grafting done at the time of the primary operation.

Dr. BRANDEGEE said that he had pursued a method for filling mastoid wounds, which consisted of repeated instrumental irritation of the wound followed by loose packing with gauze and balsam of Peru. The irritation caused free bleeding; granulation followed; repeated irritation gave rise to more bleeding, followed by more granulation tissue formation, and so on, the wound gradually filling. He reported a case treated in this way in which the result had been satisfactory.

Sarcoma of the middle ear and mastoid. Dr. DENCH presented the case of a child one and a half years old, who had come under his care three weeks ago, giving a history of having had a slight watery discharge from one ear for ten days. Examination of the eyes showed paralysis of the right external rectus muscle. The canal of the ear was filled with a tumor covered with thin epithelium. This bled easily, and a small piece was detached. The report of the pathologist showed that the tumor consisted of simple granulation tissue covered with epithelium. The child was sent to the hospital, and two days later the typical mastoid operation was done. On exposing the bone over the mastoid there was found a cauliflower-like mass occupying the region of the antrum. This was removed and the bone was found to be softened in every direction from the site of the growth. All soft bone was removed, and in so doing the dura over the roof of the tympanum was exposed. There was free bleeding, and it seemed on examination that the growth extended to the apex of the petrous pyramid, and that involvement of the dura at this point accounted for the paralysis of the sixth nerve. The growth was at first thought to be benign, but further examination showed it to be an epithelial sarcoma. The child has since done well, the wound has closed, and there has been some improvement in the power of the sixth nerve. There is, however, evidence of recurrence of the growth at the tip of the petrous pyramid and in the canal. A micro-photograph of the growth was shown. In regard to the future of the patient, Dr. Dench expressed the opinion that it would probably die; however, he has decided, if the patient's condition continues as at present, to make a thorough extirpation of the growth by a modified Gasserian ganglion operation. He had done this on the cadaver and found the operation to be simple and to give a good exposure of and free access to the upper surface of the pyramid. It is also his intention to tie the common carotid to cut off the blood supply to the part and thus retard the growth, the method of cutting off the arterial supply having been found valuable in treating new growths in the nose and naso-pharynx.

Dr. HORN presented a case of **epithelioma of the tragus.** The patient, B. R., aged forty-eight, female, four years ago noticed a small abrasion over the tragus followed by ulceration. This would heal about every two weeks and then recur, and the process of healing and ulcerating has continued until about four weeks ago. There is no noticeable glandular enlargement. Various local applications have been tried without permanent result. Microscopical examination has not been made.

Discussion.—Dr. DENCH asked if there was a tubercular history.

Dr. HORN replied that there was not.

Dr. DENCH said that, granting the growth was malignant, the history was favorable for removal. He had previously reported three cases of malignant growth of the auricle, one involving the cervical glands, in which the growth and glands were successfully removed. In another case, without glandular involvement, the excision of a triangular piece, embracing the growth, with suture of the edges of the wound, gave relief. In a third case resembling the one presented by Dr. Horn, the growth was successfully excised. He considered the results in these cases exceedingly satisfactory if prompt surgical measures were instituted.

Dr. HARRIS presented a case of **continued mastoid pain after operation.** The case was presented for diagnosis, the following history being given: Young woman, twenty-four years old, was first seen in April, 1902, and kept under observation for two weeks. At that time she complained of pain over the region of the mastoid and some elevation of temperature. There was a history of old suppurative disease, but there had been no discharge for some time previous. The drum was entirely absent. The patient was operated on in April, and no diseased bone was found nor any granulation tissue; the wound healed almost by first intention. For a short time after the operation all pain disappeared from the mastoid, but she complained of pain above and higher up; this latter has persisted until the present time. The patient has been treated by Dr. Leszynsky with electricity, tonics, and KI. On recent examination it was found that pain was present *over* the mastoid along the line of incision. This pain comes on twice a week and is so severe that the patient seeks relief from anodynes. She is well nourished, able to work, and eats well, except while the pain is present. At the time the pain comes on there is a watery discharge from the ear. There is also tenderness over the upper portion of the temporal bone and over the mastoid; also when the pain is present over the mastoid on the operated side it is also present on the other side where there has been no trouble at all.

Discussion.—Dr. DUEL asked if there was any eburnation of the bone found at operation, and if there had been a previous purulent condition.

Dr. HARRIS answered yes to both questions.

Dr. DUEL asked if the pain was not constant.

Dr. HARRIS replied that it was not constant, and that for two months following operation there had been no pain at all on deep pressure over the mastoid; the pain was referred higher up.

Dr. DUEL asked if there had been any examination of the fundus.

Dr. HARRIS replied that there had not been such examination.

Dr. DUEL then said that he considered that an examination of the fundus was quite necessary in cases where there was eburnation of the mastoid and where the pain continued so severe and intermittent as in the case presented; he suggested that the source of the trouble might be deep-seated, or it might possibly be of an hysterical nature if all of the diseased area had been removed at the first operation.

Dr. FRANK N. LEWIS asked the condition of the reflexes.

Dr. HARRIS stated that the case was reported negative, except that the patient was somewhat reduced in health.

Dr. DENCH asked about the temperature; its height, was it constant? and was the patient sleepless on account of the pain?

Dr. HARRIS replied that the average temperature was 1 to 1.5° above normal; it was constant, and the patient could not sleep on account of pain when present.

Dr. J. OSCROFT TANSLEY referred to a case of Dr. Holt, of Portland, Maine, where great mastoid pain was complained of and the mastoid was opened. The pain continued and the temperature ran as high as 106° to 107°; this would be the condition in the mouth, the rectal temperature being normal. Later the condition would be reversed, the high temperature showing in the rectum while the temperature in the mouth was normal. Nothing at all was found abnormal on exposing the brain at a second operation, and the case was diagnosed and proved by subsequent events to be hysteria.

Dr. MCKERNON asked if at any time there was tenderness in the upper part of the temporal bone and over the ridge.

Dr. HARRIS stated that this was the region referred to as being tender at all times.

Dr. MCKERNON further asked if there had been any vertigo or chills.

Dr. HARRIS said no.

Dr. KENEFICK asked if the teeth had been examined.

Dr. HARRIS said no.

Report of cases and technique of procedure in establishing hearing for deaf-mutes. By MAURY M. STAPLER, M.D., Georgia. After reading the paper Dr. Stapler demonstrated the use of the "rarefier" on two deaf-mutes. He stated that the instrument was yet very new and experience in its use was wanting, but he desired to present it to the Section with a report of the cases where it had been used successfully, and expressed the hope that future experience in its use would further demonstrate its value.

Discussion.—Dr. MCKERNON wished to know if this method of treatment was applicable to those cases where there was a relaxed condition of the upper and posterior part of the drum membrane, and if any results followed its use in old cases of otitis media catarrhalis chronica.

Dr. STAPLER replied that it could be used in those cases, and he narrated a case of his own in an elderly person who had been getting worse. He stated that after four days' treatment the hearing was restored to the degree of usefulness. This was the only case of the kind he had observed.

Dr. **Brandegee** wished to know if Dr. Stapler had any statistics on the results of the rarefying treatment in tinnitus aurium.

Dr. **Stapler** said that he had three cases in which the tinnitus was entirely stopped; the greatest duration of the condition had been in one case, one and a half years. Long-standing cases had not been affected. He did not know, in any of the cases, to what the tinnitus was due.

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